INSTALLATION RESTORATION PROGRAM

REMEDIAL INVESTIGATION REPORT

MINNESOTA AIR NATIONAL GUARD BASE
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA

VOLUME 7

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
Operated by MARTIN MARIETTA ENERGY SYSTEMS, INC
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

REPORT DOCUMENTATION PAGE

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
January 1990

3. REPORT TYPE AND DATES COVERED
Final Remedial Investigation Report

4. TITLE AND SUBTITLE
Remedial Investigation Report
Minnesota Air National Guard Base
Duluth International Airport
Duluth, Minnesota Volume 1-final report

5. FUNDING NUMBERS

6. AUTHOR(S)
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Hazardous Waste Remedial Actions Program
Oak Ridge, TN

Air National Guard Bureau
Andrews Air Force Base, Maryland 20331

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
Volume 2-Appendices Volume 3-Appendices Volume 4-Appendices
Volume 5-Appendices Volume 6-Appendices Volume 7-Appendices

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release;
distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

The report describes the remedial actions performed on sites confirmed to contain hazardous waste contamination which endangers the human health. The actions performed are described and the potential for future problems. The study was conducted under the Air National Guard's Installation Restoration Program.

14. SUBJECT TERMS
Installation Restoration Program
Remedial Investigation Report
Minnesota Air National Guard

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE

19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT

REMEDIAL INVESTIGATION REPORT

MINNESOTA AIR NATIONAL GUARD BASE
DULUTH INTERATIONAL AIRPORT
Duluth, Minnesota

VOLUME 7

JANUARY 1990

Prepared By

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Prepared For

HAZARDOUS WASTE
REMEDIAL ACTIONS PROGRAM
Oak Ridge, Tennessee

Submitted To

MINNESOTA AIR NATIONAL GUARD
Duluth International Airport
Duluth, Minnesota

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PREFACE

Engineering-Science (ES) entered into an agreement with the HAZWRAP Support Contractor office operated by Martin Marietta Energy Systems, Inc. for the U.S. Department of Energy (DOE) to perform a Remedial Investigation at the Minnesota Air National Guard Base, Duluth International Airport, Duluth, Minnesota, to be submitted to the National Guard Bureau, Andrews Air Force Base, Maryland. This investigation was initiated in July, 1988 under Task Order Y02, General Order 18B-97387C, which is under DOE contract DE-AC05-84OR21400, with Martin Marietta Energy Systems under Interagency Agreement 1489-1489-A1. The overall objectives of this effort were to define the magnitude, extent, direction, and rate of movement of identified contaminants and to summarize the need for remedial actions based on an assessment of risks to human health and the environment.

This investigation was performed by Engineering-Science personnel from the Oak Ridge, Tennessee office with oversight provided by Martin Marietta Energy Systems. Mr. Larry Janssen, of Martin Marietta Energy Systems was the Technical Monitor for Lt. Col. Michael Washeleski of the National Guard Bureau. Major Joel D. Manns, Minnesota Air National Guard Base, Duluth, Minnesota, provided field support. Engineering-Science personnel included Mr. Robert S. McLeod, P.E., P.G., who served as Project Manager and Mr. John D. Hardeman, P.G., who served as the Field Team Leader. Mr. Robert L. Thoem, P.E. was the ES Technical Director for the project.

Engineering-Science wishes to acknowledge North Star Drilling, Little Falls, Minnesota as the drilling and well installation subcontractor. Salo Engineering, Duluth, Minnesota, provided professional surveying services. ES Berkeley Laboratory, Berkeley, California; ES Atlanta Laboratory, Atlanta, Georgia; MetaTrace, Inc., St. Louis, Missouri; NUS Corporation, Pittsburgh, Pennsylvania; and IT Radiological Sciences Laboratory, Oak Ridge, TN provided analytical laboratory services for sample analyses.

This work was accomplished between July 1988 and March 1989.

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Volume 7 of this report consists of the following:

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Included is information obtained from sampling of water wells and ground water and listed in data tables. Data of hazardous materials such as pesticides and chemicals found in soils and in runoff from watersheds is also listed.

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INTRODUCTION

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SECTION N.1
INTRODUCTION

This appendix presents a summary and review of the quality control results for laboratory analyses of surface water, sediment, soil, and ground-water samples collected during the first sampling round as part of the field program for the Remedial Investigation at the Minnesota Air National Guard Base, Duluth, Minnesota. Sample holding times and sample contamination are presented in Sections N.2 and N.3 respectively. Data validation for volatile organic, semi-volatile organic, pesticide, PCB and inorganic analyses are presented in Section N.4. Section N.5 contains field quality control samples including trip blanks, field blanks, field duplicates and bailer rinseate samples.

Samples were collected from July 1988 through September 1988. Nitrate analyses were performed by MetaTrace Corporation, Earth City, Missouri. Radiological analyses were performed by NUS Corporation, Pittsburgh, Pennsylvania. All other analyses were performed by Engineering-Science, Inc., Berkeley, California.

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SECTION N.2
HOLDING TIME ANALYSES

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SECTION N.2
HOLDING TIME ANALYSES

The tables in this Section, Tables N-1 through N-20, give the sample collection date; the laboratory extraction date and elapsed time; and the laboratory analysis date and the elapsed time for each analysis that was performed on each sample. These times can be compared with the maximum holding times which are also given on each table.

If a holding time was missed this is indicated by an exclamation point next to the reported analyte concentration in the corresponding analytical results table in Appendix I.

Explanations of reasons why particular analyses were cancelled is explained in the footnotes to tables in Appendix L which can be found by looking up the analysis for the sample of interest in the corresponding table in Appendix L. The reason for cancellation is usually that the analysis was incorrectly requested.

TABLE N-1
Area/Background
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Surface Water Samples

	SL1 9-24-88 DANGB BG-SL1-GW-1 88092694	SL1 FB 9-24-88 DANGB FB16 88092698	SL2 9-24-88 DANGB BG-SL2-SW-1 88092695	SL3 9-24-88 DANGB-BG-SL3-SW-1 88092696	SL4 9-23-88 DANGB BG-SL4-SW-1 88092677	SL4 DUP 9-23-88 DANGB-BG-SL25-SW-1 88092678	SL5 9-23-88 DANGB-BG-SL5-SW-1 88092681	TB1 9-24-88 DANGB-TB12 88092697
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	24 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed	28 Sep 88	29 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88
Elapsed Time	4 Days	5 Days	4 Days	4 Days	5 Days	5 Days	5 Days	4 Days
2nd Column	---------	3 Oct 88	3 Oct 88	29 Sep 88	---------	---------	---------	29 Sep 88
Elapsed Time	---------	9 Days	9 Days	5 Days	---------	---------	---------	5 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed	28 Sep 88	29 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88
Elapsed Time	4 Days	5 Days	4 Days	4 Days	5 Days	5 Days	5 Days	4 Days
2nd Column	---------	---------	---------	29 Sep 88	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	5 Days	---------	---------	---------	---------
PESTICIDES AND PCBs (EPA 608)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION						
Date Extracted	29 Sep 88	Analysis Not	29 Sep 88	29 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	Analysis Not
Elapsed Time	5 Days	Requested	5 Days	5 Days	5 Days	5 Days	5 Days	Requested
Date Analyzed	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88	24 Oct 88	24 Oct 88	24 Oct 88	Analysis Not
Elapsed Time	30 Days	Requested	30 Days	30 Days	31 Days	31 Days	31 Days	Requested
2nd Column	---------	Analysis Not	---------	---------	---------	---------	---------	Analysis Not
Elapsed Time	---------	Requested	---------	---------	---------	---------	---------	Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED						
Date Extracted	10 Oct 88	Analysis Not	10 Oct 88	10 Oct 88	11 Oct 88	11 Oct 88	8 Oct 88	Analysis Not
Elapsed Time	16 Days	Requested	16 Days	16 Days	18 Days	18 Days	15 Days	Requested
Date Analyzed	11 Oct 88	Analysis Not	11 Oct 88	12 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	Analysis Not
Elapsed Time	17 Days	Requested	17 Days	18 Days	27 Days	27 Days	27 Days	Requested

TABLE N-1
(Continued)

	SL1 9-24-88 DANGB-BG-SL1-GW-1 88092694	SL1 FB 9-24 88 DANGB-FB16 88092698	SL2 9-24-88 DANGB-BG-SL2-SW-1 88092695	SL3 9-24-88 DANGB BG-SL3 SW-1 88092696/88092724	SL4 9-23 88 DANGB-BG-SL4-SW-1 88092677	SL4 DUP 9-23-88 DANGB-BG-SL25-SW-1 88092678	SL5 9-23-88 DANGB-BG-SL5-SW-1 88092681	TB1 9-24-88 DANGB-TB12 88092697
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	24 Sep 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	16 Oct 88	Analysis Not	16 Oct 88	21 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	Analysis Not
Elapsed Time	22 Days	Requested	22 Days	27 Days	23 Days	23 Days	23 Days	Requested
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	13 Oct 88	Analysis Not	13 Oct 88	21 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not
Elapsed Time	19 Days	Requested	19 Days	28 Days	20 Days	20 Days	20 Days	Requested
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	26 Oct 88	Analysis Not	26 Oct 88	27 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88	Analysis Not
Elapsed Time	32 Days	Requested	32 Days	33 Days	32 Days	32 Days	32 Days	Requested
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	19 Oct 88	Analysis Not	19 Oct 88	21 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	Analysis Not
Elapsed Time	25 Days	Requested	25 Days	28 Days	26 Days	26 Days	26 Days	Requested
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	24 Oct 88	Analysis Not	24 Oct 88	22 Oct 88	21 Oct 88	24 Oct 88	24 Oct 88	Analysis Not
Elapsed Time	30 Days	Requested	30 Days	29 Days	28 Days	31 Days	31 Days	Requested
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTION					
Date Analyzed	22 Oct 88	Analysis Not	22 Oct 88	22 Oct 88	14 Oct 88	22 Oct 88	22 Oct 88	Analysis Not
Elapsed Time	28 Days	Requested	28 Days	29 Days	21 Days	29 Days	29 Days	Requested
SEMI-VOLATILE ORGANICS (EPA 625)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted	30 Sep 88	Analysis Not	30 Sep 88	30 Sep 88	29 Sep 88	2[illegible] Sep 88	29 Sep 88	Analysis Not
Elapsed Time	6 Days	Requested	6 Days	6 Days	6 Days	6 Days	6 Days	Requested
Date Analyzed	9 Nov 88	Analysis Not	9 Nov 88	23 Nov 88	8 Nov 88	8 Nov 88	23 Nov 88	Analysis Not
Elapsed Time	46 Days	Requested	46 Days	60 Days	4[illegible] Days	46 Days	61 Days	Requested

TABLE N-2
Area/Background
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Sediment Samples

	SL1 9-24-88 DANGB-BG-SL1-SD-1 88092733	SL2 9-24-88 DANGB-BG-SL2-SD-1 88092732	SL3 9-24-88 DANGB-BG-SL3-SD-1 88092731	SL4 9-23-88 DANGB-BG-SL4-SD-1 88092673	SL4 DUP 9-23-88 DANGB-BG-SL25-SD-1 88092674	SL5 9-23-88 DANGB-BG-SL5-SD-1 88092672
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION					
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	12 Days	12 Days	12 Days	11 Days	11 Days	11 Days
2nd Column	--------	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	--------	--------
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION					
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	12 Days	12 Days	12 Days	11 Days	11 Days	11 Days
2nd Column	--------	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	--------	--------
PESTICIDES AND PCBs (SW8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted	27 Oct 88	7 Oct 88	7 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	34 Days	14 Days	14 Days	11 Days	11 Days	11 Days
Date Analyzed	25 Oct 88	25 Oct 88	25 Oct 88	26 Oct 88	25 Oct 88	25 Oct 88
Elapsed Time	32 Days	32 Days	32 Days	33 Days	32 Days	32 Days
2nd Column	--------	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED					
Date Extracted	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88
Elapsed Time	20 Days	21 Days	21 Days	21 Days	21 Days	21 Days
Date Analyzed	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88
Elapsed Time	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days

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(Continued)

	SL1 9-24-88 DANGB-BG-SL1-SD-1 88092733	SL2 9-24-88 DANGB-BG-SL2-SD-1 88092732	SL3 9-24-88 DANGB-BG-SL3-SD-1 88092731	SL4 9-23-88 DANGB-BG-SL4-SD-1 88092673	SL4 DUP 9-23-88 DANGB-BG-SL25-SD-1 88092674	SL5 9-23-88 DANGB-BG-SL5-SD-1 88092672
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	17 Oct 88	17 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88
Elapsed Time	23 Days	23 Days	22 Days	23 Days	23 Days	23 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	23 Days	23 Days	23 Days	24 Days	24 Days	24 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	18 Oct 88	18 Oct 88	18 Oct 88	20 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	24 Days	24 Days	24 Days	27 Days	24 Days	24 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88
Elapsed Time	24 Days	24 Days	24 Days	25 Days	25 Days	25 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	25 Oct 88	16 Oct 88	16 Oct 88	25 Oct 88	25 Oct 88	16 Oct 88
Elapsed Time	31 Days	22 Days	22 Days	32 Days	32 Days	23 Days
Mercury (SW7471)	ANALYZE WITHIN 28 DAYS OF COLLECTION					
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	24 Days	24 Days	24 Days	24 Days	24 Days	24 Days
SEMI-VOLATILE ORGANICS (SW8270)	NO HOLDING TIME SPECIFIED					
Date Extracted	7 Oct 88	7 Oct 88	7 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	14 Days	6 Days	14 Days	12 Days	12 Days	12 Days
Date Analyzed	15 Nov 88	30 Nov 88	15 Nov 88	10 Nov 88	11 Nov 88	10 Nov 88
Elapsed Time	53 Days	68 Days	51 Days	58 Days	59 Days	58 Days

TABLE N-3
Area/Background
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Soil Samples

	MW32-SS1 2-3 8-29-88 DANGB-BG-MW32-SS1 88082186	MW32-R SS1 0-1 8-31-88 DANGB-BG-MW32-SS1 88092244	MW32-R SS1 DUP 0-1 8-31-88 DANGB-BG-MW32-SS4 88092245	MW32-SS2 11-12 8-29-88 NGB-BG-BG-MW32-SS2 88082187	MW32-SS3 19-20 8-29-88 DANGB-BG-MW32-SS3 88082188	MR42-SS1 0-1 8-18-88 DANGB-BG-MW42-SS1 88081970
Date Collected	29 Aug 88	31 Aug 88	31 Aug 88	29 Aug 88	29 Aug 88	18 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	7 Sep 88	13 Sep 88	13 Sep 88	7 Sep 88	7 Sep 88	31 Aug 88
Elapsed Time	9 Days	13 Days	13 Days	9 Days	9 Days	13 Days
2nd Column	8 Sep 88	12 Sep 88	12 Sep 88	8 Sep 88	8 Sep 88	30 Aug 88
Elapsed Time	10 Days	12 Days	12 Days	10 Days	10 Days	12 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	7 Sep 88	13 Sep 88	13 Sep 88	7 Sep 88	7 Sep 88	31 Aug 88
Elapsed Time	9 Days	13 Days	13 Days	9 Days	9 Days	13 Days
2nd Column	8 Sep 88	11 Sep 88	11 Sep 88	8 Sep 88	8 Sep 88	31 Aug 88
Elapsed Time	10 Days	11 Days	11 Days	10 Days	10 Days	13 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	7 Sep 88	9 Sep 88	9 Sep 88	7 Sep 88	7 Sep 88	27 Aug 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days	9 Days
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	26 Sep 88
Elapsed Time	37 Days	35 Days	35 Days	37 Days	37 Days	39 Days
2nd Column	---------	7 Oct 88	---------	---------	---------	---------
Elapsed Time	---------	37 Days	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED				
Date Extracted	26 Sep 88	22 Sep 88	22 Sep 88	26 Sep 88	26 Sep 88	14 Sep 88
Elapsed Time	28 Days	22 Days	22 Days	28 Days	28 Days	27 Days
Date Analyzed	27 Sep 88	23 Sep 88	23 Sep 88	27 Sep 88	27 Sep 88	15 Sep 88
Elapsed Time	29 Days	23 Days	23 Days	29 Days	29 Days	28 Days

TABLE N-3
(Continued)

	MW42 SS2 7-8 8-18 88 DANGB BG MW42-SS2 88081968	MW42-SS3 14.5-15.5 8-18-88 DANGB BG-MW42-SS3 88081971	MW43-SS1 1-2 8-18-88 DANGB-BG-MW43-SS1 88081967	MW43-SS2 14-15 8-18 88 DANGB BG-MW43 SS2 88081969	MW43-SS3 23-24 8-18-88 DANGB-BG-MW43-SS3 88081966
Date Collected	18 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days	13 Days
2nd Column	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88
Elapsed Time	12 Days	12 Days	12 Days	12 Days	12 Days
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days	13 Days
2nd Column	31 Aug 88	31 Aug 88	31 [illegible] 88	31 Aug 88	31 Aug 88
Elapsed Time	13 Days	13 Days	[illegible] Days	13 Days	13 Days
PESTICIDES AND PCBs (SW8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	27 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days
Date Analyzed	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
Elapsed Time	39 Days	39 Days	39 Days	39 Days	39 Days
2nd Column	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED				
Date Extracted	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	27 Days
Date Analyzed	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days	28 Days

TABLE N-3
(Continued)

	MW32-SS1 2-3 DANGB BG-MW32 SS1 88082186	MW32-R SS1 0-1 DANGB-BG-MW32 SS1 88092244	MW32-R SS1 DUP 0-1 DANGB-BG-MW32-SS4 88092245	MW32 SS2 11-12 DANGB-BG-MW32-SS2 88082187	MW32-SS3 19-20 DANGB BG-MW32-SS3 88082188	MR42-SS1 0-1 DANGB BG MW42 SS1 88081970
Data Collected	29 Aug 88	31 Aug 88	31 Aug 88	29 Aug 88	29 Aug 88	18 Aug 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	10 Oct 88	11 Oct 88	11 Oct 88	10 Oct 88	10 Oct 88	6 Oct 88
Elapsed Time	42 Days	41 Days	41 Days	42 Days	42 Days	49 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sept 88
Elapsed Time	52 Days	50 Days	50 Days	52 Days	52 Days	32 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Anal ·ed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sept 88
Elapsed Ti. ·	52 Days	50 Days	50 Days	52 Days	52 Days	32 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sept 88
Elapsed Time	52 Days	50 Days	50 Days	52 Days	52 Days	32 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	11 Oct 88
Elapsed Time	52 Days	50 Days	52 Days	52 Days	52 Days	54 Days
Mercury (SW7471)	ANALYZE WITHIN 28 DAYS OF COLLECTION					
Date Analyzed	28 Sep 88	22 Sep 88	22 Sep 88	28 Sep 88	28 Sep 88	14 Sep 88
Elapsed Time	30 Days	22 Days	22 Days	30 Days	30 Days	27 Days
PERCENT MOISTURE						
Date Analyzed	7 Sep 88	9 Sep 88	9 Sep 88	7 Sep 88	7 Sep 88	29 Aug 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days	11 Days
SEMI-VOLATILE ORGANICS (SW8270)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted	8 Sep 88	10 Sep 88	10 Sep 88	8 Sep 88	8 Sep 88	2 Nov 88
Elapsed Time	9 Days	10 Days	10 Days	9 Days	9 Days	76 Days
Date Analyzed	30 Nov 88	21 Oct 88	21 Oct 88	17 Oct 88	17 Oct 88	21 Nov 88
Elapsed Time	93 Days	51 Days	51 Days	49 Days	48 Days	95 Days

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(Continued)

	MW42-SS2 7-8 8-18-88 DANGB BG-MW42 SS2 88081968	MW42-SS3 14.5-15.5 8-18-88 DANGB BG-MW42 SS3 88081971	MW43 SS1 1-2 8-18-88 DANGB-BG-MW43-SS1 88081967	MW43-SS2 14-15 8-18 88 DANGB-BG-MW43-SS2 88081969	MW43-SS3 23 24 8-18-88 DANGB-BG-MW43-SS3 88081966
Data Collected	18 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	6 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	49 Days	49 Days	49 Days	49 Days	49 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	32 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	32 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	32 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	11 Oct 88	11 Oct 88	11 Oct 88	11 Oct 88	11 Oct 88
Elapsed Time	54 Days	54 Days	54 Days	54 Days	54 Days
Mercury (SW7471)	ANALYZE WITHIN 28 DAYS OF COLLECTION				
Date Analyzed	13 Sep 88	14 Sep 88	13 Sep 88	14 Sep 88	13 Sep 88
Elapsed Time	26 Days	27 Days	26 Days	27 Days	26 Days
PERCENT MOISTURE					
Date Analyzed	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88
Elapsed Time	11 Days	11 Days	11 Days	11 Days	11 Days
SEMI-VOLATILE ORGANICS (SW8270)	NO HOLDING TIME SPECIFIED				
Date Extracted	27 Aug 88	2 Nov 88	27 Aug 88	27 Aug 88	27 Aug 88
Elapsed Time	9 Days	76 Days	9 Days	9 Days	9 Days
Date Analyzed	26 Oct 88	21 Nov 88	5 Oct 88	26 Oct 88	5 Oct 88
Elapsed Time	69 Days	95 Days	48 Days	69 Days	48 Days

TABLE N-4
Area/Background
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Ground-Water Samples

	MW32 9-8-88 DANGB BG-MW32-GW1 88092306	MW42 9-8 88 DANGB-BG-MW42 GW-1 88092305	MW42 FB 9-8 88 DANGB FB2 88092307	MW43 9-7-88 DANGB BG-MW43 GW-1 88092293	MW43 DUP 9-7-88 DANGB-BG-MW50 GW-1 88092292	MW43 FB 9-7-88 DANGB-FB1 88092294	TB1 9-8-88 DANGB-TB1 88092308	BR1 9-7-88 DANGB-BR1 88092291
Date Collected	8 Sep 88	8 Sep 88	8 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	8 Sep 88	7 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88
Elapsed Time	8 Days	8 Days	6 Days	7 Days	7 Days	7 Days	6 Days	7 Days
2nd Column	14 Sep 88	14 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	--------
Elapsed Time	6 Days	6 Days	8 Days	9 Days	9 Days	9 Days	8 Days	--------
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88
Elapsed Time	8 Days	8 days	6 Days	7 Days	7 Days	7 Days	6 Days	7 Days
2nd Column	--------	--------	--------	--------	--------	16 Sep 88	--------	--------
Elapsed Time	--------	--------	--------	--------	--------	9 Days	--------	--------
PESTICIDES AND PCBs (EPA 608)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	14 Sep 88	14 Sep 88	Analysis Not	9 Sep 88	9 Sep 88	Analysis Not	Analysis Not	9 Sep 88
Elapsed Time	6 Days	6 Days	Requested	2 Days	2 Days	Requested	Requested	2 Days
Date Analyzed	6 Oct 88	6 Oct 88	Analysis Not	6 Oct 88	6 Oct 88	Analysis Not	Analysis Not	6 Oct 88
Elapsed Time	28 Days	28 Days	Requested	29 Days	29 Days	Requested	Requested	29 Days
2nd Column	--------	--------	Analysis Not	--------	--------	Analysis Not	Analysis Not	--------
Elapsed Time	--------	--------	Requested	--------	--------	Requested	Requested	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED							
Date Extracted	28 Sep 88	28 Sep 88	Analysis Not	23 Sep 88	23 Sep 88	Analysis Not	Analysis Not	23 Sep 88
Elapsed Time	20 Days	20 Days	Requested	16 Days	16 Days	Requested	Requested	16 Days
Date Analyzed	5 Oct 88	5 Oct 88	Analysis Not	26 Sep 88	26 Sep 88	Analysis Not	Analysis Not	26 Sep 88
Elapsed Time	27 Days	27 Days	Requested	19 Days	19 Days	Requested	Requested	19 Days

TABLE N-4
(Continued)

	MW32 9-8-88 DANGB-BG-MW32 GW-1 88092306	MW42 9-8-88 DANGB[illegible]MW42 GW-1 88092305	MW42 FB 9-8-88 DANGB FB2 88092307	MW43 9-7-88 DANGB-BG-MW43 GW-1 88092293	MW43 DUP 9-7-88 DANGB-BG-MW50 GW-1 88092292	MW43 FB 9-7-88 DANGB-FB1 88092294	TB1 9-8-88 DANGB-TB1 88092308	BR1 9-7-88 DANGB-BR1 88092291
Date Collected	8 Sep 88	8 Sep 88	8 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	8 Sep 88	7 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	4 Nov 88	4 Nov 88	Analysis Not	4 Nov 88	4 Nov 88	Analysis Not	Analysis Not	4 Nov 88
Elapsed Time	57 Days	57 Days	Requested	58 Days	58 Days	Requested	Requested	58 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	17 Oct 88	17 Oct 88	Analysis Not	17 Oct 88	17 Oct 88	Analysis Not	Analysis Not	17 Oct 88
Elapsed Time	39 Days	39 Days	Requested	40 Days	40 Days	Requested	Requested	40 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	24 Oct 88	21 Oct 88	Analysis Not	26 Oct 88	26 Oct 88	Analysis Not	Analysis Not	26 Oct 88
Elapsed Time	46 Days	43 Days	Requested	49 Days	49 Days	Requested	Requested	49 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	28 Oct 88	28 Oct 88	Analysis Not	28 Oct 88	28 Oct 88	Analysis Not	Analysis Not	28 Oct 88
Elapsed Time	50 Days	50 Days	Requested	51 Days	51 Days	Requested	Requested	51 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	20 Oct 88	20 Oct 88	Analysis Not	20 Oct 88	20 Oct 88	Analysis Not	Analysis Not	20 Oct 88
Elapsed Time	42 Days	42 Days	Requested	43 Days	43 Days	Requested	Requested	43 Days
Mercury (SW7471)	ANALYZE WITHIN 28 DAYS OF COLLECTION							
Date Analyzed	27 Sep 88	27 Sep 88	Analysis Not	27 Sep 88	27 Sep 88	Analysis Not	Analysis Not	27 Sep 88
Elapsed Time	19 Days	19 Days	Requested	20 Days	20 Days	Requested	Requested	20 Days
SEMI-VOLATILE ORGANICS (EPA 625)	NO HOLDING TIME SPECIFIED							
Date Extracted	14 Sep 88	14 Sep 88	Analysis Not	1 Jan 89	9 Sep 88	Analysis Not	Analysis Not	12 Sep 88
Elapsed Time	6 Days	6 Days	Requested	115 Days	2 Days	Requested	Requested	5 Days
Date Analyzed	23 Oct 88	23 Oct 88	Analysis Not	13 Jan 89	21 Oct 88	Analysis Not	Analysis Not	21 Oct 88
Elapsed Time	45 Days	45 Days	Requested	127 Days	44 Days	Requested	Requested	44 Days

TABLE N-5
Site 2
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Surface Water Samples

	SL6 9-26-88 DANGB-2-SL6-SW-1 88092769	SL6 DUP 9-26-88 DANGB-2-SL29-SW-1 88092768	SL6 FB 9-26-88 DANGB-FB20 88092775	SL7 9-26-88 DANGB-2-SL7 GW-1 88092770	TB1 9-26-88 DANGB-TB14 88092773
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	4 Oct 88	4 Oct 88	3 Oct 88	4 Oct 88	3 Oct 88
Elapsed Time	8 Days	8 Days	7 Days	8 Days	7 Days
2nd Column	30 Sep 88	--------	--------	30 Sep 88	--------
Elapsed Time	4 Days	--------	--------	4 Days	--------
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	30 Sep 88	30 Sep 88	3 Oct 88	30 Sep 88	3 Oct 88
Elapsed Time	4 Days	4 Days	7 Days	4 Days	7 Days
2nd Column	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION			
Date Extracted	12 Oct 88	12 Oct 88	Analysis Not Requested	12 Oct 88	Analysis Not Requested
Elapsed Time	16 Days	16 Days		16 Days	
Date Analyzed	21 Oct 88	21 Oct 88	Analysis Not Requested	21 Oct 88	Analysis Not Requested
Elapsed Time	25 Days	25 Days		25 Days	

TABLE N-5
(Continued)

	SL6 9-26-88 DANGB 2-SL6-SW-1 88092769	SL6 DUP 9 26-88 DANGB 2-SL29-SW-1 88092768	SL6 FB 9-26-88 DANGB-FB20 88092775	SL7 9-26-88 DANGB 2-SL7 GW-1 88092770	TB1 9 26-88 DANGB-TB14 88092773
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION		
Date Analyzed	21 Oct 88	21 Oct 88	Analysis Not	21 Oct 88	Analysis Not
Elapsed Time	25 Days	25 Days	Requested	25 Days	Requested
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION		
Date Analyzed	27 Oct 88	27 Oct 88	Analysis Not	27 Oct 88	Analysis Not
Elapsed Time	31 Days	31 Days	Requested	31 Days	Requested
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION		
Date Analyzed	21 Oct 88	21 Oct 88	Analysis Not	21 Oct 88	Analysis Not
Elapsed Time	25 Days	25 Days	Requested	25 Days	Requested
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION		
Date Analyzed	22 Oct 88	22 Oct 88	Analysis Not	22 Oct 88	Analysis Not
Elapsed Time	26 Days	26 Days	Requested	26 Days	Requested
SEMI-VOLATILE ORGANICS (EPA 625)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION		
Date Extracted	30 Sep 88	30 Sep 88	Analysis Not	30 Sep 88	Analysis Not
Elapsed Time	4 Days	4 Days	Requested	4 Days	Requested
Date Analyzed	9 Nov 88	9 Nov 88	Analysis Not	9 Nov 88	Analysis Not
Elapsed Time	44 Days	44 Days	Requested	44 Days	Requested

TABLE N-6
Site 2
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Sediment Samples

	SL6 9 26-88 DANGB-2-SL6 SD 1 88092800	SL6 DUP 9 26-88 DANGB 2 SL29-SD-1 88092801	SL7 9 26-88 DANGB-2-SL7-SD-1 88092799
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days
2nd Column	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days
2nd Column	--------	--------	--------
Elapsed Time	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED		
Date Extracted	18 Oct 88	18 Oct 88	18 Oct 88
Elapsed Time	22 Days	22 Days	22 Days
Date Analyzed	25 Oct 88	25 Oct 88	25 Oct 88
Elapsed Time	29 Days	29 Days	29 Days

TABLE N-6
(Continued)

	SL6 9-26-88 DANGB 2-SL6-SD-1 88092800	SL6 DUP 9 26-88 DANGB-2 SL29-SD-1 88092801	SL7 9-26-88 DANGB-2-SL7-SD-1 88092799	
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	17 Oct 88	18 Oct 88	17 Oct 88	
Elapsed Time	21 Days	22 Days	21 Days	
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	
Elapsed Time	21 Days	21 Days	21 Days	
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	19 Oct 88	20 Oct 88	19 Oct 88	
Elapsed Time	23 Days	24 Days	23 Days	
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	18 Oct 88	20 Oct 88	18 Oct 88	
Elapsed Time	22 Days	24 Days	22 Days	
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	19 Oct 88	25 Oct 88	18 Oct 88	
Elapsed Time	23 Days	29 Days	22 Days	
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTION	
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	
Elapsed Time	21 Days	21 Days	21 Days	
PERCENT MOISTURE				
Date Analyzed	10 Oct 88	10 Oct 88	10 Oct 88	
Elapsed Time	14 Days	14 Days	14 Days	
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION	
Date Extracted	Not	Not	Not	
Elapsed Time	Given	Given	Given	
Date Analyzed	Not	Not	Not	
Elapsed Time	Given	Given	Given	

TABLE N-7
Site 2
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Soil Samples

	BH1-SS1 0-2 7-29 88 DANGB-2-BH1-SS1 88071554	BH1-SS2 2-4 7-29 88 DANGB-2 BH1-SS2 88071553	BH1-SS4 6-8 7-29-88 DANGB-2 BH1-SS4 88071552	BH1-SS5 8 10 7-29-88 DANGB-2-BH1-SS5 88071555	BH1 SS6 10-12 7-30 88 DANGB-2-BH1-SS6 88081589	BH2-SS1 0-2 7-30-88 DANGB 2 BH2-SS1 88081590	BH2-SS4 6-8 7-30 88 DANGB-2-BH2-SS4 88081591	BH2-SS6 10-12 7-30 88 DANGB-2-BH2-SS6 88081592	BH2-SS9 16-18 7-30-88 DANGB-2-BH2-SS9 88081593	BH1-R SS1 0-2 8-30 88 DANGB-2-BH1-SS1 88092215
Date Collected	29 Jul 88	29 Jul 88	29 Jul 88	29 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	8 Sep 88
Elapsed Time	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	9 Days
2nd Column	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	9 Sep 88
Elapsed Time	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	8 Sep 88
Elapsed Time	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	9 Days
2nd Column	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	9 Sep 88
Elapsed Time	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	Broken	10 Days
PESTICIDES AND PCBs			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	Analysis Not
Elapsed Time	6 Days	6 Days	6 Days	6 Days	5 Days	5 Days	5 Days	5 Days	5 Days	Requested
Date Analyzed	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	Analysis Not
Elapsed Time	11 Days	11 Days	11 Days	11 Days	10 Days	10 Days	10 Days	10 Days	10 Days	Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	3 Aug 88	3 Aug 88	3 Aug 88	3 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	Analysis
Elapsed Time	5 Days	5 Days	5 Days	5 Days	6 Days	6 Days	6 Days	6 Days	6 Days	Cancelled
Date Analyzed	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88	Analysis
Elapsed Time	6 Days	6 Days	6 Days	6 Days	20 Days	20 Days	20 Days	20 Days	20 Days	Cancelled

TABLE N-7
Continued

	BH1 R-SS2 2-4 8-30-88 DANGB-2-BH1-SS2 88092216	BH1 R-SS3 6-8 8-30-88 DANGB-2-BH1-SS3 88092218	BH1 R-SS4 8-10 8-30 88 DANGB 2-BH1-SS4 88092217	BH1 R-SS5 10-12 8-30 88 DANGB-2-BH1-SS5 88092219	BH1 R-SS6 15-17 8 30 88 DANGB 2 BH1-SS6 88092223	BH1 R-SS7 22-24 8-30 88 DANGB 2 BH1-SS7 88092224	BH2 R-SS1 0 2 8-30-88 DANGB-2-BH2-SS1 88092220	BH2 R-SS2 5-6 8-30 88 DANGB-2-BH2-SS2 88092221	BH2 R-SS3 10-12 8-30-88 DANGB-2-BH2-SS3 88092222	BH2 R-SS4 14-15 8-30-88 DANGB-2-BH2-SS4 88092225
Date Collected	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	8 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	11 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	11 Sep 88
Elapsed Time	9 Days	10 Days	10 Days	10 Days	10 Days	12 Days	10 Days	10 Days	10 Days	12 Days
2nd Column	9 Sep 88	9 Sep 88	9 Sep 88	10 Sep 88	11 Sep 88	9 Sep 88	10 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88
Elapsed Time	10 Days	10 Days	10 Days	11 Days	12 Days	10 Days	11 Days	10 Days	10 Days	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	8 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	11 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	11 Sep 88
Elapsed Time	9 Days	10 Days	10 Days	10 Days	10 Days	12 Days	10 Days	10 Days	10 Days	12 Days
2nd Column	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	11 Sep 88	9 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	9 Sep 88
Elapsed Time	11 Days	11 Days	11 Days	11 Days	12 Days	10 Days	12 Days	12 Days	12 Days	10 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	Analysis	Analysis	Analysis	Analysis	22 Sep 88	22 Sep 88	Analysis	Analysis	Analysis	22 Sep 88
Elapsed Time	Cancelled	Cancelled	Cancelled	Cancelled	23 Days	23 Days	Cancelled	Cancelled	Cancelled	23 Days
Date Analyzed	Analysis	Analysis	Analysis	Analysis	23 Sep 88	23 Sep 88	Analysis	Analysis	Analysis	23 Sep 88
Elapsed Time	Cancelled	Cancelled	Cancelled	Cancelled	24 Days	24 Days	Cancelled	Cancelled	Cancelled	24 Days

TABLE N-7
Continued

	BH2 R-SS5 20-22 8-30-88 DANGB-2 BH2-SS5 88092226	BH2 R-SS6 24-25 8-30 88 DANGB-2-BH2-SS6 8809? ?7	MW12A-SS1 0-2 8-5 88 DANGB-2 MW12-SS 88081661	MW12A-SS1 DUP 0-2 8-5-88 DANGB-2 MW12-SS 88081664	MW12A-SS3 5-15 8-5 88 DANGB-2-MW12 SS 88081662	MW12A-SS5 15-20 8-5-88 DANGB-2-MW12-SS 88081663	MW13A-SS1 0-2 8 5-88 DANGB-2-MW13-SS 88081692	MW13A-SS3 8-10 8-5-88 DANGB-2-MW13-SS 88081693	MW13A-SS4 14-15 8-5-88 DANGB-2-MW13-SS 88081694	MW37-SS1 0-1 8-15 88 DANGB-2-MW37 SS 88081883
Date Collected	30 Aug 88	30 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	15 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	10 Sep 88	10 Sep 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	23 Aug 88
Elapsed Time	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	8 Days
2nd Column	11 Sep 88	11 Sep 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	23 Aug 88
Elapsed Time	12 Days	12 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	8 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	10 Sep 88	10 Sep 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	23 Aug 88
Elapsed Time	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	8 Days
2nd Column	11 Sep 88	11 Sep 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	24 Aug 88
Elapsed Time	12 Days	12 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	9 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	22 Sep 88	22 Sep 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	9 Sep 88
Elapsed Time	23 Days	23 Days	10 Days	10 Days	10 Days	10 Days	24 Days	24 Days	24 Days	25 Days
Date Analyzed	23 Sep 88	23 Sep 88	19 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	11 Sep 88
Elapsed Time	24 Days	24 Days	14 Days	14 Days	14 Days	14 Days	26 Days	26 Days	26 Days	27 Days

TABLE N-7
Continued

	MW37-SS2 5-6 8-15-88 DANGB-2-MW37-SS 88081884	MW37-SS2 DUP 5-6 8-15-88 DANGB-2-MW37-SS 88081887	MW37-SS3 16-17 8-15 88 DANGB-2-MW37-SS 88081885	MW37-SS4 17.5-18 8-15-88 DANGB-2-MW37-SS 88081886	MW38-SS1 0-1.5 8-13-88 DANGB-2 MW38-SS 88081877	MW38-SS2 9-10.5 8-13-88 DANGB-2-MW38-SS 88081878	MW38-SS3 17-19 8-13-88 DANGB 2-MW38-SS 88081879	MW39-SS1 0-1 8-15-88 DANGB-2-MW39-SS 88081888	MW39-SS2 5-6 8-15-88 DANGB-2-MW39-SS 88081889	MW39-SS3 21-22 8-15 88 DANGB-2-MW39-SS 88081890
Date Collected	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	13 Aug 88	13 Aug 88	13 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	24 Aug 88	24 Aug 88	25 Aug 88
Elapsed Time	8 Days	8 Days	8 Days	8 Days	10 Days	10 Days	10 Days	9 Days	9 Days	10 Days
2nd Column	23 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	22 Aug 88	22 Aug 88	23 Aug 88	23 Aug 88	24 Aug 88	23 Aug 88
Elapsed Time	8 Days	9 Days	9 Days	9 Days	9 Days	9 Days	10 Days	8 Days	9 Days	8 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	24 Aug 88	23 Aug 88	25 Aug 88
Elapsed Time	8 Days	8 Days	8 Days	8 Days	10 Days	10 Days	10 Days	9 Days	8 Days	10 Days
2nd Column	23 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	23 Aug 88	23 Aug 88	23 Aug 88	24 Aug 88	24 Aug 88	25 Aug 88
Elapsed Time	8 Days	9 Days	9 Days	9 Days	10 Days	10 Days	10 Days	9 Days	9 Days	10 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88
Elapsed Time	25 Days	25 Days	25 Days	25 Days	27 Days	27 Days	27 Days	25 Days	25 Days	25 Days
Date Analyzed	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88	11 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	29 Days	29 Days	29 Days	27 Days	27 Days	27 Days

TABLE N-7
Continued

	MW40-SS1 0-1 8-16-88 DANGB-2-MW40-SS 88081898	MW40-SS2 7-8 8-16-88 DANGB-2-MW40-SS 88081899	MW40-SS3 15.5-16.5 8-16-88 DANGB-2-MW40-SS 88081900	MW41-SS1 0-5 8-17-88 DANGB-2-MW41-SS 88081938	MW41-SS1 DUP 0-5 8-17-88 DANGB-2-MP41-SS1 88081940	MW41-SS2 5-15 8-17-88 DANGB-2-MW41-SS 88081939	MW41-SS2 DUP 5-15 8-17-88 DANGB-2-MP41-SS2 88081942	MW41-SS3 15-20 8-17-88 DANGB-2-MW41-SS3 88081941
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION					
Date Analyzed	26 Aug 88	26 Aug 88	26 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	26 Aug 88	26 Aug 88
Elapsed Time	10 Days	10 Days	10 Days	12 Days	12 Days	12 Days	9 Days	9 Days
2nd Column	22 Aug 88	22 Aug 88	22 Aug 88	25 Aug 88	25 Aug 88	25 Aug 88	30 Aug 88	30 Aug 88
Elapsed Time	6 Days	6 Days	6 Days	8 Days	8 Days	8 Days	13 Days	13 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION					
Date Analyzed	26 Aug 88	26 Aug 88	26 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	26 Aug 88	26 Aug 88
Elapsed Time	10 Days	10 Days	10 Days	12 Days	12 Days	12 Days	9 Days	9 Days
2nd Column	22 Aug 88	25 Aug 88	22 Aug 88	25 Aug 88	25 Aug 88	25 Aug 88	30 Aug 88	30 Aug 88
Elapsed Time	6 Days	9 Days	6 Days	8 Days	8 Days	8 Days	13 Days	13 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED					
Date Extracted	12 Sep 88	12 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	29 Days	29 Days	29 Days	29 Days	29 Days
Date Analyzed	13 Sep 88	13 Sep 88	13 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88
Elapsed Time	28 Days	28 Days	28 Days	30 Days	30 Days	30 Days	30 Days	30 Days

TABLE N-7
Continued

	BH1-SS1 0-2 7-29-88 DANGB-2-BH1-SS1 88071554	BH1-SS2 2-4 7-29-88 DANGB-2-BH1-SS2 88071553	BH1-SS4 6-8 7-29-88 DANGB 2-BH1-SS4 88071552	BH1-SS5 8-10 7-29-88 DANGB-2 BH1-SS5 88071555	BH1-SS6 10-12 7-30 88 DANGB 2 BH1-SS6 88081589	BH2-SS1 0-2 7-30-88 DANGB-2-BH2-SS1 88081590	BH2-SS4 6-8 7-30-88 DANGB 2-BH2 SS4 88081591	BH2-SS6 10-12 7-30-88 DANGB-2-BH2-SS6 88081592	BH2-SS9 16-18 7-30-88 DANGB-2-BH2-SS9 88081593	BH1 R-SS1 0-2 8-30-88 DANGB-2-BH1-SS1 88092215
Date Collected	29 Jul 88	29 Jul 88	29 Jul 88	29 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Jul 88	30 Aug 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	17 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	Analysis Not Requested
Elapsed Time	19 Days	19 Days	19 Days	19 Days	17 Days	17 Days	17 Days	17 Days	17 Days	
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	1 Aug 88	1 Aug 88	1 Aug 88	1 Aug 88	1 Aug 88	Analysis Cancelled
Elapsed Time	11 Days	11 Days	11 Days	11 Days	2 Days	2 Days	2 Days	2 Days	2 Days	
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	9 Aug 88	Analysis Cancelled
Elapsed Time	17 Days	17 Days	17 Days	17 Days	10 Days	10 Days	10 Days	10 Days	10 Days	
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Cancelled
Elapsed Time										
Lead (SW7421)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS							
Date Analyzed	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	Analysis Cancelled
Elapsed Time	17 Days	17 Days	17 Days	17 Days	16 Days	16 Days	16 Days	16 Days	16 Days	
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS							
Date Analyzed	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	12 Aug 88	Analysis Not Requested
Elapsed Time	14 Days	14 Days	14 Days	14 Days	13 Days	13 Days	13 Days	13 Days	13 Days	
PERCENT MOISTURE										
Date Analyzed	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	4 Aug 88	13 Sep 88
Elapsed Time	6 Days	6 Days	6 Days	6 Days	5 Days	5 Days	5 Days	5 Days	5 Days	14 Days
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	2 Aug 88	Analysis Cancelled
Elapsed Time	4 Days	4 Days	4 Days	4 Days	3 Days	3 Days	3 Days	3 Days	3 Days	
Date Analyzed	25 Aug 88	22 Aug 88	24 Aug 88	19 Aug 88	20 Aug 88	25 Aug 88	24 Aug 88	23 Aug 88	24 Aug 88	Analysis Cancelled
Elapsed Time	27 Days	24 Days	26 Days	21 Days	21 Days	26 Days	25 Days	21 Days	25 Days	

TABLE N-7
Continued

	BH1 R-SS2 2-4 8-30-88 DANGB-2-BH1-SS2 88092216	BH1 R-SS3 6-8 8-30-88 DANGB-2-BH1-SS3 88092218	BH1 R-SS4 8-10 8-30 88 DANGB-2-BH1-SS4 88092217	BH1 R-SS5 10-12 8 30-88 DANGB-2-BH1-SS5 88092219	BH1 R-SS6 15-17 8-30-88 DANGB-2-BH1-SS6 88092223	BH1 R-SS7 22-24 8-30-88 DANGB-2-BH1-SS7 88092224	BH2 R-SS1 0-2 8-30-88 DANGB-2-BH2-SS1 88092220	BH2 R-SS2 5 6 8-30 88 DANGB-2-BH2-SS2 88092221	BH2 R-SS3 10-12 8-30-88 DANGB-2-BH2-SS3 88092222	BH2 R-SS4 14-15 8-30-88 DANGB-2-BH2-SS4 88092225
Date Collected	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days	20 Oct 88 5[illegible] Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days	20 Oct 88 51 Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days	20 Oct 88 51 Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	26 Oct 88 57 Days	26 Oct 88 57 Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	17 Oct 88 48 Days
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS							
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE										
Date Analyzed Elapsed Time	13 Sep 88 14 Days	13 Sep 88 14 Days	13 Sep 88 14 Days	13 Sep 88 14 Days	9 Sep 88 10 Days	9 Sep 88 10 Days	13 Sep 88 14 Days	13 Sep 88 14 Days	13 Sep 88 14 Days	9 Sep 88 10 Days
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	10 Sep 88 11 Days	10 Sep 88 11 Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	10 Sep 88 11 Days
Date Analyzed Elapsed Time	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days	22 Oct 88 53 Days	Analysis Cancelled	Analysis Cancelled	Analysis Cancelled	20 Oct 88 51 Days

TABLE N-7
Continued

	BH2-SS5 R 23-22 8-30-88 DANGB-2-BH2-SS5 88092226	BH2 R-SS6 24-25 8-30-88 DANGB-2-BH2-SS6 88092227	MW12A-SS1 0 2 8-5 88 DANGB 2-MW12-SS 88081661	MW12A-SS1 DUP 0 2 8-5 88 DANGB-2-MW12-SS 88081664	MW12-SS3 5-15 8-5 88 DANGB-2-MW12-SS 88081662	MW12A-SS5 15-20 8-5-88 DANGB-2-MW12-SS 88081663	MW13A-SS1 0-2 8-5 88 DANGB-2 MW13-SS 88081692	MW13A-SS3 8-10 8-5-88 DANGB-2-MW13-SS 88081693	MW13A-SS4 14-15 8-5-88 DANGB-2-MW13-SS 88081694	MW37-SS1 0-1 8-15-88 DANGB-2-MW37-SS 88081883
Date Collected	30 Aug 88	30 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	5 Aug 88	15 Aug 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	18 Sep 88
Elapsed Time	51 Days	51 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	34 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	16 Sep 88
Elapsed Time	51 Days	51 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	32 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	16 Sep 88
Elapsed Time	51 Days	51 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	33 Days	32 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	25 Oct 88	20 Oct 88	12 Sep 88	12 Sep 88	12 Sep 88	12 Sep 88	13 Sep 88	13 Sep 88	13 Sep 88	23 Sep 88
Elapsed Time	56 Days	51 Days	38 Days	38 Days	38 Days	38 Days	39 Days	39 Days	39 Days	39 Days
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS							
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE										
Date Analyzed	9 Sep 88	9 Sep 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	21 Aug 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days	10 Days	10 Days	10 Days	10 Days	10 Days	6 Days
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	29 Oct 88	10 Sep 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88			25 Aug 88
Elapsed Time	60 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days			10 Days
Date Analyzed	2 Nov 88	22 Oct 88	14 Sep 88	15 Sep 88	20 Sep 88	15 Sep 88	15 Sep 88	18 Sep 88	18 Sep 88	1 Oct 88
Elapsed Time	64 Days	53 Days	10 Days	41 Days	46 Days	41 Days	41 Days	44 Days	44 Days	46 Days

TABLE N-7
Continued

	MW37-SS2 5-6 8-15 88 DANGB-2-MW37-SS 88081884	MW37-SS2 DUP 5 6 8-15-88 DANGB-2-MW37-SS 88081887	MW37-SS3 16-17 8-15-88 DANGB-2-MW37 SS 88081885	MW37-SS4 17.5-18 8-15-88 DANGB-2-MW37 SS 88081886	MW38-SS1 0-1.5 8-13 88 DANGB-2 MW38-SS 88081877	MW38-SS2 9-10.5 8-13-88 DANGB-2-MW38-SS 88081878	MW38-SS3 17-19 8-13-88 DANGB-2 MW38-SS 88081879	MW39-SS1 0-1 8-15-88 DANGB-2-MW39-SS 88081888	MW39-SS2 5-6 8-15-88 DANGB-2-MW39-SS 88081889	MW39-SS3 21-22 8-15-88 DANGB-2-MW39-SS 88081890
Date Collected	15 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88	13 Aug 88	13 Aug 88	13 Aug 88	15 Aug 88	15 Aug 88	15 Aug 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed / Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88
Elapsed Time	34 Days	34 Days	34 Days	34 Days	36 Days	36 Days	36 Days	34 Days	34 Days	34 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	34 Days	34 Days	34 Days	32 Days	32 Days	32 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	34 Days	34 Days	34 Days	32 Days	32 Days	32 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88
Elapsed Time	[illegible] Days	39 Days	39 Days	39 Days	41 Days	41 Days	41 Days	39 Days	39 Days	39 Days
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS							
Date Analyzed / Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE										
Date Analyzed	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88	21 Aug 88
Elapsed Time	6 Days	6 Days	6 Days	6 Days	8 Days	8 Days	8 Days	6 Days	6 Days	6 Days
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	25 Aug 88	28 Oct 88	25 Aug 88	25 Aug 88	19 Aug 88	19 Aug 88	18 Oct 88	25 Aug 88	[illegible] 88	26 Aug 88
Elapsed Time					6 Days	6 Days	66 Days	10 Days	[illegible] Days	11 Days
Date Analyzed	1 Oct 88	2 Nov 88	1 Oct 88	3 Oct 88	30 Aug 88	30 Aug 88	27 Oct 88	3 Oct 88	2 Nov 88	5 Oct 88
Elapsed Time	46 Days	78 Days	46 Days	47 Days	17 Days	17 Days	75 Days	49 Days	78 Days	40 Days

TABLE N-7
Continued

	MW40-SS1 0-1 8-16-88 DANGB-2-MW40-SS 88081898	MW40-SS2 7-8 8-16-88 DANGB-2-MW40 SS 88081899	MW10-SS3 15.5-16.5 8-16-88 DANGB 2 MW10 SS 88081900	MW41-SS1 0-5 8-17-88 DANGB-2-MW41-SS 88081938	MW41-SS1 DUP 0 5 8-17 88 DANGB-2-MP41 SS1 88081940	MW41-SS2 5-15 8-17-88 DANGB-2-MW41-SS 88081939	MW41-SS2 DUP 5-15 8-17-88 DANGB-2-MP41-SS2 88081942	MW41-SS3 15-20 8-17-88 DANGB-2-MW41-SS3 88081941
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88
Arsenic (SW7060)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not
Elapsed Time	Requested	Requested	Requested	Requested	Requested	Requested	Requested	Requested
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88
Elapsed Time	22 Days	22 Days	22 Days	32 Days	32 Days	32 Days	32 Days	32 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	22 Days	22 Days	22 Days	30 Days	30 Days	30 Days	30 Days	30 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	22 Days	22 Days	22 Days	30 Days	30 Days	30 Days	30 Days	30 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	21 Sep 88	21 Sep 88	21 Sep 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88
Elapsed Time	36 Days	36 Days	36 Days	47 Days	47 Days	47 Days	47 Days	47 Days
Mercury (SW7471)			ANALYZE WITHIN 28 DAYS OF COLLECTIONS					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not	Analysis Not
Elapsed Time	Requested	Requested	Requested	Requested	Requested	Requested	Requested	Requested
PERCENT MOISTURE								
Date Analyzed	24 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88	24 Aug 88
Elapsed Time	8 Days	8 Days	8 Days	7 Days	7 Days	7 Days	7 Days	7 Days
SEMI-VOLATILE ORGANICS (SW8270)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	28 Oct 88	28 Oct 88	28 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	9 Days	9 Days	72 Days	72 Days	72 Days
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	3 Oct 88	5 Oct 88	21 Nov 88	2 Nov 88	1 Nov 88
Elapsed Time	39 Days	39 Days	39 Days	47 Days	49 Days	96 Days	77 Days	76 Days

TABLE N-8
Site 2
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Ground-Water Samples

	MW 1 9-19-88 DANGB-2-MW1-GW-1 88092524	MW 2 9-19-88 DANGB-2-MW1-GW-1 88092523	MW 4 9-21-88 DANGB-2-MW4 GW-1 88092575	MW 5 9-22-88 DANGB-2-MW5-GW-1 88092614	MW 5 FB 9-22-88 DANGB-FB15 88092618	MW 6 9-22-88 DANGB-2 MW6-GW-1 88092613	MW7 9-22-88 DANGB-2-MW7-GW-1 88092612	GW 2 A 9-21-88 DANGB-2-GW2A-GW-1 88092573	GW 2-A DUP 9-21-88 DANGB-2-MW56-GW-1 88092574	GW 2-A FB 9-21-88 DANGB FB13 88092580
Date Collected	19 Sep 88	19 Sep 88	21 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	23 Sep 88	27 Sep 88	23 Sep 88	29 Sep 88	29 Sep 88	27 Sep 88	27 Sep 88	23 Sep 88	23 Sep 88	26 Sep 88
Elapsed Time	4 Days	8 Days	2 Days	7 Days	7 Days	5 Days	5 Days	2 Days	2 Days	5 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	23 Sep 88	27 Sep 88	23 Sep 88	29 Sep 88	30 Sep 88	30 Sep 88	27 Sep 88	23 Sep 88	23 Sep 88	26 Sep 88
Elapsed Time	4 Days	8 Days	2 Days	7 Days	8 Days	8 Days	5 Days	2 Days	2 Days	5 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	Not	5 Oct 88	1 Oct 88	1 Oct 88	Analysis Not	1 Oct 88	1 Oct 88	4 Oct 88	1 Oct 88	Analysis Not
Elapsed Time	Given	16 Days	10 Days	9 Days	Requested	9 Days	9 Days	13 Days	10 Days	Requested
Date Analyzed	8 Oct 88	8 Oct 88	10 Oct 88	10 Oct 88	Analysis Not	10 Oct 88	10 Oct 88	8 Oct 88	10 Oct 88	Analysis Not
Elapsed Time	19 Days	19 Days	19 Days	18 Days	Requested	18 Days	18 Days	17 Days	19 Days	Requested

TABLE N-8
(Continued)

	GW 2 B 9-22-88 DANGB-2 GW2B GW-1 88092616	GW 2 C 9-21-88 DANGB-2 GW2C-GW-1 88092576	GW 2 C I-B 9 21-88 DANGB-I-BI4 88092581	GW 2 D 9-21 88 DANGB-2-GW2D GW-1 88092577	GW 2 E 9-20 88 DANGB-2 GW2E-GW-1 88092549	MW37 9-20 88 DANGB-2-MW37-GW-1 88092547	MW38 9-22 88 DANGB-2 MW38-GW-1 88092615	MW39 9-21-99 DANGB-2-MW39-GW-1 88092578	MW40 9 20-88 DANGB-2-MW40-GW-1 88092550	MW40 DUP 9-20-88 DANGB-2-MW55-GW-1 88092551
Date Collected	22 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	20 Sep 88	20 Sep 88	22 Sep 88	21 Sep 88	20 Sep 88	20 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	27 Sep 88	23 Sep 88	28 Sep 88	23 Sep 88	27 Sep 88	23 Sep 88	29 Sep 88	23 Sep 88	28 Sep 88	23 Sep 88
Elapsed Time	5 Days	2 Days	7 Days	2 Days	7 Days	3 Days	7 Days	2 Days	8 Days	3 Days
2nd Column	--------	--------	30 Sep 88	--------	28 Sep 88	27 Sep 88	--------	--------	26 Sep 88	28 Sep 88
Elapsed Time	--------	--------	9 Days	--------	8 Days	7 Days	--------	--------	6 Days	8 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	3 Oct 88	23 Sep 88	28 Sep 88	23 Sep 88	27 Sep 88	23 Sep 88	29 Sep 88	23 Sep 88	28 Sep 88	23 Sep 88
Elapsed Time	11 Days	2 Days	7 Days	2 Days	7 Days	3 Days	7 Days	2 Days	8 Days	3 Days
2nd Column	--------	--------	--------	--------	28 Sep 88	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	8 Days	--------	--------	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418 1)		NO HOLDING TIME SPECIFIED								
Date Extracted	1 Oct 88	1 Oct 88	Analysis Not	1 Oct 88	5 Oct 88	5 Oct 88	1 Oct 88	1 Oct 88	5 Oct 88	5 Oct 88
Elapsed Time	9 Days	10 Days	Requested	10 Days	15 Days	15 Days	9 Days	10 Days	15 Days	15 Days
Date Analyzed	10 Oct 88	10 Oct 88	Analysis Not	8 Oct 88	8 Oct 88	8 Oct 88	10 Oct 88	10 Oct 88	8 Oct 88	8 Oct 88
Elapsed Time	18 Days	19 Days	Requested	17 Days	18 Days	18 Days	18 Days	19 Days	18 Days	18 Days

TABLE N-8
(Continued)

	MW41 9-20 88 DANGB-2-MW41-GW-1 88092548	BR1 9 20-88 DANGB BR9 88092546	BR2 9 21-88 DANGB BR10 8809257[illegible]	TB1 9 21-88 DANGB-TB10 88092582	TB2 9 22-88 DANGB TB11 88092619
Date Collected	20 Sep 88	20 Sep 88	21 Sep 88	16 Sep 88	22 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	23 Sep 88	26 Sep 88	23 Sep 88	28 Sep 88	28 Sep 88
Elapsed Time	3 Days	6 Days	2 Days	12 Days	6 Days
2nd Column	27 Sep 88	27 Sep 88	28 Sep 88	29 Sep 88	--------
Elapsed Time	7 Days	7 Days	7 Days	13 Days	--------
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	23 Sep 88	23 Sep 88	23 Sep 88	28 Sep 88	28 Sep 88
Elapsed Time	3 Days	3 Days	2 Days	12 Days	6 Days
2nd Column	--------	--------	--------	--------	--------
Elapsed Time	--------	--------	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418 1)			NO HOLDING TIME SPECIFIED		
Date Extracted	5 Oct 88	5 Oct 88	1 Oct 88	Analysis Not	Analysis Not
Elapsed Time	15 Days	15 Days	10 Days	Requested	Requested
Date Analyzed	8 Oct 88	8 Oct 88	Not	Analysis Not	Analysis Not
Elapsed Time	18 Days	18 Days	Given	Requested	Requested

TABLE N-8
(Continued)

	MW 1 9-19 88 DANGB-2-MW1-GW-1 88092524	MW 2 9-19 88 DANGB-2-MW1-GW-1 88092523	MW 4 9-21-88 DANGB-2-MW4-GW-1 88092575	MW 5 9-22 88 DANGB-2-MW5-GW-1 88092614	MW 5 FB 9-22 88 DANGB FB15 88092618	MW 6 9-22-88 DANGB-2-MW6-GW-1 88092613	MW 7 9-22 88 DANGB-2-MW7-GW-1 88092612	GW 2-A 9-21-88 DANGB-2 GW2A-GW-1 88092573	GW 2-A DUP 9-21-88 DANGB-2-MW56-GW-1 88092574	GW 2-A FB 9-21-88 DANGB-FB13 88092580
Date Collected	19 Sep 88	19 Sep 88	21 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not
Elapsed Time	24 Days	24 Days	22 Days	21 Days	Requested	21 Days	21 Days	21 Days	21 Days	Requested
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	26 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88	Analysis Not	26 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88	Analysis Not
Elapsed Time	37 Days	37 Days	35 Days	34 Days	Requested	34 Days	34 Days	34 Days	34 Days	Requested
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	16 Oct 88	16 Oct 88	16 Oct 88	19 Oct 88	Analysis Not	19 Oct 88	19 Oct 88	16 Oct 88	16 Oct 88	Analysis Not
Elapsed Time	27 Days	27 Days	25 Days	27 Days	Requested	27 Days	27 Days	24 Days	24 Days	Requested
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	21 Oct 88	21 Oct 88	21 Oct 88	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88	21 Oct 88	21 Oct 88	Analysis Not
Elapsed Time	32 Days	32 Days	30 Days	32 Days	Requested	32 Days	32 Days	29 Days	29 Days	Requested
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	24 Sep 88	24 Sep 88	27 Sep 88	28 Sep 88	Analysis Not	28 Sep 88	28 Sep 88	27 Oct 88	27 Oct 88	Analysis Not
Elapsed Time	5 Days	5 Days	6 Days	6 Days	Requested	6 Days	6 Days	36 Days	36 Days	Requested
Date Analyzed	31 Oct 88	31 Oct 88	5 Nov 88	7 Nov 88	Analysis Not	7 Nov 88	6 Nov 88	5 Nov 88	30 Nov 88	Analysis Not
Elapsed Time	42 Days	42 Days	45 Days	45 Days	Requested	45 Days	44 Days	45 Days	61 Days	Requested

TABLE N-8
(Continued)

	GW 2-B 9-22-88 DANGB-2-GW2B-GW 1 88092616	GW 2 C 9-21-88 DANGB-2-GW2C-GW-1 88092576	GW 2-C FB 9-21-88 DANGB FB14 88092581	GW 2-D 9-21-88 DANGB-2 GW2D GW-1 88092577	GW 2-E 9 20-88 DANGB-2-GW2E GW-1 88092549	MW37 9-20-88 DANGB-2-MW37-GW-1 88092547	MW38 9-22-88 DANGB-2-MW38-GW-1 88092615	MW39 9-21-99 DANGB-2-MW39-GW-1 88092578	MW40 9-20-88 DANGB-2-MW40-GW-1 88092550	MW40 DUP 9-20-88 DANGB-2-MW55-GW-1 88092551
Date Collected	22 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	20 Sep 88	20 Sep 88	22 Sep 88	21 Sep 88	20 Sep 88	20 Sep 88
Barium (SW6010)			ANALYZE WITIN 180 DAYS OF COLLECTION							
Date Analyzed	13 Oct 88	13 Oct 88	Analysis Not	13 Oct 88	13 Oct 88	13 Oct 88	21 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88
Elapsed Time	21 Days	22 Days	Requested	22 Days	23 Days	23 Days	29 Days	22 Days	23 Days	23 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	26 Oct 88	26 Oct 88	Analysis Not	26 Oct 88	26 Oct 88	26 Oct 88	27 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88
Elapsed Time	34 Days	35 Days	Requested	35 Days	36 Days	36 Days	35 Days	35 Days	36 Days	36 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	19 Oct 88	16 Oct 88	Analysis Not	16 Oct 88	26 Oct 88	16 Oct 88	21 Oct 88	19 Oct 88	16 Oct 88	16 Oct 88
Elapsed Time	27 Days	25 Days	Requested	25 Days	36 Days	26 Days	29 Days	28 Days	26 Days	26 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	24 Oct 88	21 Oct 88	Analysis Not	21 Oct 88	21 Oct 88	21 Oct 88	22 Oct 88	21 Oct 88	21 Oct 88	21 Oct 88
Elapsed Time	32 Days	30 Days	Requested	30 Days	31 Days	31 Days	30 Days	30 Days	31 Days	31 Days
SEMI-VOLATILE ORGANICS (EPA 625)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	28 Sep 88	27 Sep 88	Analysis Not	27 Sep 88	24 Sep 88	24 Sep 88	28 Sep 88	27 Sep 88	24 Sep 88	24 Sep 88
Elapsed Time	6 Days	6 Days	Requested	6 Days	4 Days	4 Days	6 Days	6 Days	4 Days	4 Days
Date Analyzed	6 Nov 88	30 Nov 88	Analysis Not	5 Nov 88	2 Nov 88	1 Nov 88	7 Nov 88	6 Nov 88	3 Nov 88	23 Nov 88
Elapsed Time	44 Days	68 Days	Requested	45 Days	43 Days	42 Days	46 Days	46 Days	44 Days	64 Days

TABLE N-8
(Continued)

	MW41 9-20-88 DANGB-2 MW41-GW-1 88092548	BR1 9-20-88 DANGB BR9 88092546	BR2 9-21-88 DANGB BR10 88092579	TB1 9-21-88 DANGB-TB10 88092582	TB2 9-22-88 DANGB-TB11 88092619
Date Collected	20 Sep 88	20 Sep 88	21 Sep 88	16 Sep 88	22 Sep 88
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not	Analysis Not
Elapsed Time	23 Days	23 Days	22 Days	Requested	Requested
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	26 Oct 88	26 Oct 88	26 Oct 88	Analysis Not	Analysis Not
Elapsed Time	36 Days	36 Days	35 Days	Requested	Requested
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	16 Oct 88	16 Oct 88	16 Oct 88	Analysis Not	Analysis Not
Elapsed Time	26 Days	26 Days	15 Days	Requested	Requested
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	21 Oct 88	21 Oct 88	21 Oct 88	Analysis Not	Analysis Not
Elapsed Time	31 Days	31 Days	30 Days	Requested	Requested
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	24 Sep 88	24 Sep 88	27 Sep 88	Analysis Not	Analysis Not
Elapsed Time	4 Days	4 Days	6 Days	Requested	Requested
Date Analyzed	1 Nov 88	1 Nov 88	6 Nov 88	Analysis Not	Analysis Not
Elapsed Time	42 Days	42 Days	46 Days	Requested	Requested

TABLE N-9
Site 3
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Surface Water Samples

	SL8 9 26 88 DANGB-3-SL8-SW-1 88092807/88092766	SL9 9-26-88 DANGB-3-SL9-SW-1 88092772	SL10 9-26-88 DANGB-3 SL10 SW-1 88092767/88092806	SL10 DUP 9-26-88 DANGB-3-SL28 SW-1 88092765	SL10 FB 9-26-88 DANGB-FB19 88092774
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	30 Sep 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88
Elapsed Time	4 Days	7 Days	7 Days	7 Days	7 Days
2nd Column	4 Oct 88	--------	--------	--------	--------
Elapsed Time	8 Days	--------	--------	--------	--------
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	30 Sep 88	30 Sep 88	3 Oct 88	3 Oct 88	3 Oct 88
Elapsed Time	4 Days	7 Days	7 Days	7 Days	7 Days
2nd Column	4 Oct 88	--------	--------	--------	--------
Elapsed Time	8 Days	--------	--------	--------	--------
PESTICIDES AND PCBs (EPA 608)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	30 Sep 88	3 Oct 88	3 Oct 88	30 Sep 88	Analysis Not
Elapsed Time	4 Days	7 Days	7 Days	4 Days	Requested
Date Analyzed	25 Oct 88	24 Oct 88	25 Oct 88	24 Oct 88	Analysis Not
Elapsed Time	29 Days	28 Days	29 Days	28 Days	Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	12 Oct 88	12 Oct 88	12 Oct 88	12 Oct 88	Analysis Not
Elapsed Time	16 Days	16 Days	16 Days	16 Days	Requested
Date Analyzed	21 Oct 88	21 Oct 88	21 Oct 88	21 Oct 88	Analysis Not
Elapsed Time	25 Days	25 Days	25 Days	25 Days	Requested

TABLE N-9
(Continued)

	SL8 9-26-88 DANGB-3-SL8-SW-1 88092807	SL9 9 26-88 DANGB-3-SL9 SW-1 88092772	SL10 9-26-88 DANGB-3 SL10-SW-1 88092767/88092806	SL10 DUP 9 26 88 DANGB-3-SL28-SW-1 88092765	SL10 FB 9-26-88 DANGB-FB19 88092774
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	21 Oct 88	21 Oct 88	21 Oct 88	Analysis Not	Analysis Not
Elapsed Time	25 Days	25 Days	25 Days	Requested	Requested
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	2 Nov 88	2 Nov 88	2 Nov 88	Analysis Not	Analysis Not
Elapsed Time	37 Days	37 Days	37 Days	Requested	Requested
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	31 Oct 88	31 Oct 88	31 Oct 88	Analysis Not	Analysis Not
Elapsed Time	35 Days	35 Days	35 Days	Requested	Requested
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	21 Oct 88	22 Oct 88	21 Oct 88	Analysis Not	Analysis Not
Elapsed Time	25 Days	26 Days	25 Days	Requested	Requested
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	24 Oct 88	24 Oct 88	24 Oct 88	Analysis Not	Analysis Not
Elapsed Time	28 Days	28 Days	28 Days	Requested	Requested
Mercury (SW7470)	ANALYZE WITHIN 28 DAYS OF COLLECTIONS				
Date Analyzed	22 Oct 88	22 Oct 88	22 Oct 88	Analysis Not	Analysis Not
Elapsed Time	26 Days	26 Days	26 Days	Requested	Requested
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	30 Sep 88	3 Oct 88	4 Oct 88	30 Sep 88	Analysis Not
Elapsed Time	4 Days	7 Days	8 Days	4 Days	Requested
Date Analyzed	9 Nov 88	23 Nov 88	11 Nov 88	10 Nov 88	Analysis Not
Elapsed Time	44 Days	58 Days	46 Days	45 Days	Requested

TABLE N-10
Site 3
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Sediment Samples

	SL8 9-26-88 DANGB 3 SL8-SD 1 88092805	SL9 9-26-88 DANGB-3 SL9-SD-1 88092804	SL10 9-26-88 DANGB-3 SL10 SD-1 88092803	SL10 DUP 9-26-88 DANGB-3-SL28-SD-1 88092802
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	6 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days
2nd Column	6 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	6 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days
2nd Column	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED		
Date Extracted	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88
Elapsed Time	22 Days	22 Days	22 Days	22 Days
Date Analyzed	25 Oct 88	25 Oct 88	25 Oct 88	25 Oct 88
Elapsed Time	29 Days	29 Days	29 Days	29 Days

TABLE N-10
(Continued)

	SL8 9-26-88 DANGB-3-SL8 SD-1 88092805	SL9 9-26-88 DANGB-3-SL9-SD-1 88092804	SL10 9-26-88 DANGB-3-SL10 SD 1 88092803	SL10 DUP 9 26-88 DANGB 3-SL28-SD-1 88092802
Date Collected	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	18 Oct 88	17 Oct 88	17 Oct 88	18 Oct 88
Elapsed Time	22 Days	21 Days	21 Days	22 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	21 Days	21 Days	21 Days	21 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	27 Oct 88	19 Oct 88	27 Oct 88	27 Oct 88
Elapsed Time	31 Days	23 Days	31 Days	31 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	19 Oct 88	19 Oct 88	19 Oct 88	18 Oct 88
Elapsed Time	23 Days	23 Days	23 Days	22 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	18 Oct 88	25 Oct 88	18 Oct 88	25 Oct 88
Elapsed Time	22 Days	29 Days	22 Days	29 Days
Mercury (SW7471)	ANALYZE WITHIN 28 DAYS OF COLLECTIONS			
Date Analyzed	20 Oct 88	17 Oct 88	20 Oct 88	17 Oct 88
Elapsed Time	24 Days	21 Days	24 Days	21 Days
PERCENT MOISTURE				
Date Analyzed	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88
Elapsed Time	14 Days	14 Days	14 Days	14 Days
SEMI-VOLATILE ORGANICS (SW8270)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION			
Date Extracted Elapsed Time	Missing Data	Missing Data	Missing Data	Missing Data
Date Analyzed Elapsed Time	Missing Data	Missing Data	Missing Data	Missing Data

TABLE N-11
Site 3
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Soil Samples

	SGA0 0-2 8-16-88 DANGB-3-SS-A0 88081912 88081950	SGA1 0-2 8-16-88 DANGB-3-SS-A1 88081955	SGA2 0-2 8-16-88 DANGB-3-SS A2 88081959	SGA3 0-2 8-16-88 DANGB-3-SS-A3 88081954	SGA4 0-2 8-16-88 DANGB 3-SS-A4 88081904	SGA4 DUP 0-2 8-17-88 DANGB-3-SS-A4 88081945	SGA5 0-2 8-17-88 DANGB-3-SS-A1 88081946	SGB1 0-2 8-16-88 DANGB-3-SS-B1 88081903 88081961	SGB2 0-2 8-17-88 DANGB-3-SS-B2 88081949	SGB3 0-2 8-16-88 DANGB-3-SS-B3 88081905
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	16 Aug 88	17 Aug 88	16 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	26 Aug 88	30 Aug 88	29 Aug 88	29 Aug 88	26 Aug 88	30 Aug 88	30 Aug 88	26 Aug 88	30 Aug 88	26 Aug 88
Elapsed Time	10 Days	14 Days	13 Days	13 Days	10 Days	13 Days	13 Days	10 Days	13 Days	10 Days
2nd Column	25 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	26 Aug 88	29 Aug 88	29 Aug 88	25 Aug 88	---------	26 Aug 88
Elapsed Time	9 Days	13 Days	13 Days	13 Days	10 Days	12 Days	12 Days	9 Days	---------	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	26 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	26 Aug 88	30 Aug 88	30 Aug 88	26 Aug 88	30 Aug 88	26 Aug 88
Elapsed Time	10 Days	13 Days	13 Days	13 Days	10 Days	13 Days	13 Days	10 Days	13 Days	10 Days
2nd Column	24 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	25 Aug 88	29 Aug 88	29 Aug 88	24 Aug 88	---------	25 Aug 88
Elapsed Time	8 Days	13 Days	13 Days	13 Days	9 Days	12 Days	12 Days	8 Days	---------	9 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	25 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	25 Aug 88	26 Aug 88	26 Aug 88	25 Aug 88	26 Aug 88	25 Aug 88
Elapsed Time	9 Days	10 Days	10 Days	10 Days	9 Days	9 Days	9 Days	9 Days	9 Days	9 Days
Date Analyzed	22 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	22 Sep 88	23 Sep 88	23 Sep 88	22 Sep 88	23 Sep 88	22 Sep 88
Elapsed Time	37 Days	38 Days	38 Days	38 Days	37 Days	37 Days	37 Days	37 Days	37 Days	37 Days
2nd Column	---------	---------	---------	---------	26 Sep 88	---------	---------	---------	26 Sep 88	26 Sep 88
Elapsed Time	---------	---------	---------	---------	41 Days	---------	---------	---------	40 Days	41 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED								
Date Extracted	12 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	12 Sep 88	14 Sep 88	12 Sep 88
Elapsed Time	27 Days	29 Days	29 Days	29 Days	27 Days	28 Days	28 Days	27 Days	28 Days	27 Days
Date Analyzed	13 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	13 Sep 88	14 Sep 88	14 Sep 88	13 Sep 88	14 Sep 88	13 Sep 88
Elapsed Time	28 Days	29 Days	29 Days	29 Days	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days

TABLE N-11
(Continued)

	SGC0 0-2 8-16-88 DANGB-3-SS C0 88081956	SGC1 0-2 8-16-88 DANGB-3-SS-C1 88081957	SGC2 0-2 8-16-88 DANGB-3 SS C2 88081901 88081962	SGC3 0 2 8-16-88 DANGB-3-SS-C3 88081958	SGC5 0-2 8-17-88 DANGB-3 SS C5 88081944	SGD0 0-2 8-18-88 DANGB-3-SS-D0 88081973	SGD1 0-2 8-18-88 DANGB-3-SS-D1 88081975	SGD1 0-2 8-17-88 DANGB 3-SS-D2 88081952	SGD3 0-2 8-30-88 DANGB-3-SGD3-SS1 88102200	SGD3 DUP 0-2 8-30-88 DANGB-3-SGD3-SS1 88102201
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	18 Aug 88	18 Aug 88	17 Aug 88	30 Aug 88	30 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	29 Aug 88	29 Aug 88	26 Aug 88	29 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	30 Aug 88	8 Sep 88	8 Sep 88
Elapsed Time	13 Days	13 Days	10 Days	13 Days	13 Days	13 Days	13 Days	13 Days	9 Days	9 Days
2nd Column	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	29 Aug 88	31 Aug 88	31 Aug 88	30 Aug 88	8 Sep 88	9 Sep 88
Elapsed Time	13 Days	13 Days	8 Days	13 Days	12 Days	13 Days	13 Days	13 Days	9 Days	10 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	29 Aug 88	29 Aug 88	26 Aug 88	29 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	30 Aug 88	8 Sep 88	8 Sep 88
Elapsed Time	13 Days	13 Days	10 Days	13 Days	13 Days	13 Days	13 Days	13 Days	9 Days	9 Days
2nd Column	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	29 Aug 88	31 Aug 88	31 Aug 88	---------	9 Sep 88	9 Sep 88
Elapsed Time	13 Days	13 Days	8 Days	13 Days	12 Days	13 Days	13 Days	---------	10 Days	10 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	25 Aug 88	26 Aug 88	26 Aug 88	27 Aug 88	27 Aug 88	26 Aug 88	9 Sep 88	9 Sep 88
Elapsed Time	10 Days	10 Days	9 Days	10 Days	9 Days	9 Days	9 Days	9 Days	10 Days	10 Days
Date Analyzed	23 Sep 88	23 Sep 88	22 Sep 88	23 Sep 88	23 Sep 88	26 Aug 88	26 Aug 88	23 Sep 88	5 Oct 88	5 Oct 88
Elapsed Time	38 Days	38 Days	37 Days	38 Days	37 Days	8 Days	8 Days	37 Days	36 Days	36 Days
2nd Column	---------	26 Sep 88	26 Sep 88	---- ----	---------	---------	3 Oct 88	26 Sep 88	---------	---------
Elapsed Time	---------	41 Days	41 Days	---------	---------	---------	46 Days	40 Days	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED								
Date Extracted	14 Sep 88	14 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	26 Sep 88	26 Sep 88
Elapsed Time	29 Days	29 Days	27 Days	29 Days	28 Days	27 Days	27 Days	28 Days	27 Days	27 Days
Date Analyzed	14 Sep 88	14 Sep 88	13 Sep 88	14 Sep 88	14 Sep 88	15 Sep 88	15 Sep 88	14 Sep 88	27 Sep 88	27 Sep 88
Elapsed Time	29 Days	29 Days	28 Days	29 Days	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days

TABLE N-11
(Continued)

	SGD4 0-2 8-17-88 DANGB-3-SS-D4 88081953	SGD5 0-2 8-17-88 DANGB-3-SS-D5 88081943	SGE0 0-2 8-18-88 DANGB-3-SS-E0 88081976	SGE1 0-2 8-18-88 DANGB-3-SS-E1 88081977	SGE2 0-2 8-18-88 DANGB-3-SS-E2 88081972	SGE3 0-2 8-30-88 DANGB-3-SGE3-SS1 88102202	SGE3 DUP 0-2 8-30-88 DANGB-3-SGE3-SS1 88102203	SGE4 0-2 8-31-88 DANGB-3-SGE4-SS2 88092248	SGE4 DUP 0-2 8-31-88 DANGB-3 SGE4-SS1 88092249	SG-49 0-2 8-18-88 DANGB-3-SS-49 88081974
Date Collected	17 Aug 88	17 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88	30 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	18 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	8 Sep 88	8 Sep 88	13 Sep 88	13 Sep 88	31 Aug 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days	13 Days	9 Days	9 Days	13 Days	13 Days	13 Days
2nd Column	30 Aug 88	29 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	9 Sep 88	9 Sep 88	12 Sep 88	12 Sep 88	31 Aug 88
Elapsed Time	13 Days	12 Days	13 Days	13 Days	13 Days	10 Days	10 Days	12 Days	12 Days	13 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	8 Sep 88	8 Sep 88	13 Sep 88	13 Sep 88	31 Aug 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days	13 Days	9 Days	9 Days	13 Days	13 Days	13 Days
2nd Column	--------	29 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	9 Sep 88	9 Sep 88	11 Sep 88	11 Sep 88	31 Aug 88
Elapsed Time	--------	12 Days	13 Days	13 Days	13 Days	10 Days	10 Days	11 Days	11 Days	13 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	27 Aug 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days	10 Days	10 Days	9 Days	9 Days	9 Days
Date Analyzed	23 Sep 88	23 Sep 88	26 Aug 88	26 Aug 88	26 Aug 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	26 Aug 88
Elapsed Time	37 Days	37 Days	8 Days	8 Days	8 Days	36 Days	36 Days	35 Days	35 Days	8 Days
2nd Column	--------	--------	4 Oct 88	--------	--------	--------	--------	--------	--------	3 Oct 88
Elapsed Time	--------	--------	47 Days	--------	--------	--------	--------	--------	--------	46 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED								
Date Extracted	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	26 Sep 88	26 Sep 88	22 Sep 88	22 Sep 88	14 Sep 88
Elapsed Time	28 Days	28 Days	27 Days	27 Days	27 Days	27 Days	27 Days	22 Days	22 Days	27 Days
Date Analyzed	14 Sep 88	14 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	27 Sep 88	27 Sep 88	23 Sep 88	23 Sep 88	15 Sep 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days	23 Days	23 Days	28 Days

TABLE N-11
(Continued)

	SG54 0-2 8-17 88 DANGB-3-SS-Z2 88081947	SG55 0-2 8-17-88 DANGB-3-SS-A3.5 88081951	SG56 0-2 8-16-88 DANGB-3 SS A3.5 88081906	SG57 0 2 8-17-88 DANGB-3 SS-A2.5 88081950	SG58 0-2 8-17 88 DANGB-3 SS-Y2 88081948	SGC4 R-SS1 9-27-88 DANGB-SGC4-SS1 R 88092782	SGC4-SS1 DUP 9 27-88 DANGB-SGC4-SS2 R 88092783	MW25-SS1 0-1 8-26-88 DANGB-3-MW25-SS1 88082146	MW25-SS2 2-3 8-26-88 DANGB-3-MW25-SS2 88082147	MW25-SS3 14-15 8-26-88 DANGB-3-MW25-SS3 88082148
Date Collected	17 Aug 88	17 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	27 Sep 88	27 Sep 88	26 Aug 88	26 Aug 88	26 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Aug 88	30 Aug 88	26 Aug 88	30 Aug 88	30 Aug 88	16 Oct 88	16 Oct 88	6 Sep 88	6 Sep 88	6 Sep 88
Elapsed Time	13 Days	13 Days	10 Days	13 Days	13 Days	19 Days	19 Days	11 Days	11 Days	11 Days
2nd Column	30 Aug 88	30 Aug 88	25 Aug 88	30 Aug 88	---------	16 Oct 88	16 Oct 88	---------	---------	---------
Elapsed Time	13 Days	13 Days	9 Days	13 Days	---------	19 Days	19 Days	---------	---------	---------
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Aug 88	30 Aug 88	26 Aug 88	30 Aug 88	30 Aug 88	16 Oct 88	16 Oct 88	6 Sep 88	6 Sep 88	6 Sep 88
Elapsed Time	13 Days	13 Days	10 Days	13 Days	13 Days	19 Days	19 Days	11 Days	11 Days	11 Days
2nd Column	30 Aug 88	---------	25 Aug 88	30 Aug 88	---------	---------	---------	---------	---------	---------
Elapsed Time	13 Days	---------	9 Days	13 Days	---------	---------	---------	---------	---------	---------
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	25 Aug 88	26 Aug 88	26 Aug 88	7 Oct 88	7 Oct 88	1 Sep 88	1 Sep 88	1 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days	10 Days	10 Days	6 Days	6 Days	6 Days
Date Analyzed	23 Sep 88	23 Sep 88	22 Sep 88	23 Sep 88	23 Sep 88	25 Oct 88	25 Oct 88	27 Sep 88	27 Sep 88	27 Sep 88
Elapsed Time	37 Days	37 Days	37 Days	37 Days	37 Days	28 Days	28 Days	32 Days	32 Days	32 Days
2nd Column	---------	---------	---------	---------	---------	26 Oct 88	26 Oct 88	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	29 Days	29 Days	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED								
Date Extracted	14 Sep 88	14 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	18 Oct 88	18 Oct 88	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	28 Days	28 Days	27 Days	28 Days	28 Days	21 Days	21 Days	26 Days	26 Days	26 Days
Date Analyzed	14 Sep 88	14 Sep 88	13 Sep 88	14 Sep 88	14 Sep 88	25 Oct 88	25 Oct 88	22 Sep 88	22 Sep 88	22 Sep 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days	28 Days	27 Days	27 Days	27 Days

TABLE N-11
(Continued)

	MW27-SS1 0-1 8-24 88 DANGB-3-MW27-SS1 88082102	MW27-SS2 5-6 8-24 88 DANGB-3-MW27-SS2 88082103	MW27-SS3 14-15 8-24 88 DANGB-3-MW27-SS3 88082104	MW28-SS1 0-1 8-27-88 DANGB-3-MW28-SS1 88082158	MW28-SS2 2-3 8-27-88 DANGB-3-MW28-SS2 88082159	MW28-SS3 14-15 8-27-88 DANGB-3-MW28-SS3 88082160	MW29-SS1 0-1 8-30-88 DANGB-3-MW29-SS1 88082196	MW29-SS2 3-4 8-30-88 DANGB-3-MW29-SS2 88082197	MW29-SS3 14-15 8-30-88 DANGB-3-MW29-SS3 88082198	MW29-SS3 DUP 14-15 8-30-88 DANGB-3-MW29-SS3 88082199
Date Collected	24 Aug 88	24 Aug 88	24 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	2 Sep 88	2 Sep 88	2 Sep 88	6 Sep 88	6 Sep 88	5 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	10 Days	10 Days	10 Days	9 Days	9 Days	9 Days	9 Days
2nd Column	--------	--------	--------	7 Sep 88	7 Sep 88	7 Sep 88	8 Sep 88	9 Sep 88	9 Sep 88	8 Sep 88
Elapsed Time	--------	--------	--------	11 Days	11 Days	11 Days	9 Days	10 Days	10 Days	9 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	1 Sep 88	1 Sep 88	1 Sep 88	6 Sep 88	6 Sep 88	6 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88
Elapsed Time	8 Days	8 Days	8 Days	10 Days	10 Days	10 Days	9 Days	9 Days	9 Days	9 Days
2nd Column	--------	--------	--------	7 Sep 88	7 Sep 88	7 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88
Elapsed Time	--------	--------	--------	11 Days	11 Days	11 Days	10 Days	10 Days	10 Days	10 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	1 Sep 88	1 Sep 88	1 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88
Elapsed Time	8 Days	8 Days	8 Days	11 Days	11 Days	11 Days	10 Days	10 Days	10 Days	10 Days
Date Analyzed	27 Sep 88	27 Sep 88	27 Sep 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88
Elapsed Time	34 Days	34 Days	34 Days	39 Days	39 Days	39 Days	36 Days	36 Days	36 Days	36 Days
2nd Column	--------	--------	--------	--------	--------	--------	7 Oct 88	7 Oct 88	--------	--------
Elapsed Time	--------	--------	--------	--------	--------	--------	38 Days	38 Days	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED								
Date Extracted	1 Sep 88	17 Sep 88	17 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88
Elapsed Time	8 Days	24 Days	24 Days	25 Days	25 Days	25 Days	27 Days	27 Days	27 Days	27 Days
Date Analyzed	27 Sep 88	19 Sep 88	19 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88
Elapsed Time	34 Days	26 Days	26 Days	26 Days	26 Days	26 Days	28 Days	28 Days	28 Days	28 Days

TABLE N-11
(Continued)

	MW30 SS1 0-1 8-30-88 DANGB-3-MW30-SS1 88082192	MW30-SS1 DUP 0-1 8-30-88 DANGB-3 MW30 SS1 88082193	MW30-SS2 9-11 8-30-88 DANGB-3-MW30-SS2 88082194	MW30-SS3 14-15 8-30-88 DANGB-3-MW30-SS3 88082195	MW31-SS1 0-1 8-27-88 DANGB-3 MW31-SS1 88082156	MW31-SS2 9-10 8-27-88 DANGB-3-MW31-SS2 88082157	MW33-SS1 0-1 8-27-88 DANGB-3-MW33-SS1 88082161	MW33-SS2 11-12 8-27-88 DANGB-3-MW33-SS2 88082162	MW33-SS3 20-21 8-27-88 DANGB-3-MW33-SS1 88082163	MW35-SS1 0-1 8-25-88 DANGB-3-MW35-SS1 88082132
Date Collected	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	27 Aug 83	27 Aug 88	25 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	8 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	6 Sep 88	6 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	3 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	10 Days	10 Days	11 Days	11 Days	11 Days	9 Days
2nd Column	8 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	8 Sep 88	8 Sep 88	3 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	11 Days	11 Days	11 Days	12 Days	12 Days	9 Days
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	8 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	6 Sep 88	6 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	3 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	10 Days	10 Days	11 Days	11 Days	11 Days	9 Days
2nd Column	8 Sep 88	8 Sep 88	8 Sep 88	9 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	8 Sep 88	8 Sep 88	6 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	10 Days	11 Days	11 Days	11 Days	12 Days	12 Days	12 Days
PESTICIDES AND PCBs (SW8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	29 Oct 88	29 Oct 88	1 Sep 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days	11 Days	11 Days	11 Days	63 Days	63 Days	7 Days
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	30 Nov 88	2 Nov 88	27 Sep 88
Elapsed Time	36 Days	36 Days	36 Days	36 Days	39 Days	39 Days	39 Days	95 Days	67 Days	33 Days
2nd Column	--------	7 Oct 88	--------	--------	--------	--------	--------	--------	--------	--------
Elapsed Time	--------	38 Days	--------	--------	--------	--------	--------	--------	--------	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED									
Date Extracted	26 Sep 88	26 Sep 88	26 Sep 88	26 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	19 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	25 Days	25 Days	25 Days	25 Days	25 Days	25 Days
Date Analyzed	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	20 Sep 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days	26 Days	26 Days	26 Days	26 Days	26 Days	26 Days

TABLE N-11
(Continued)

	MW35-SS2 2 3 8-25 88 DANGB-3-MW35-SS2 88082131	MW35-SS3 10-11.5 8-25 88 DANGB-3-MW35-SS3 88082133	MW35 SS3 DUP 10-11.5 8-25 88 DANGB-3 MW35 SS3A 88082130
Date Collected	25 Aug 88	25 Aug 88	25 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION	
Date Analyzed	3 Sep 88	3 Sep 88	3 Sep 88
Elapsed Time	9 Days	9 Days	9 Days
2nd Column	2 Sep 88	3 Sep 88	2 Sep 88
Elapsed Time	8 Days	9 Days	8 Days
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION	
Date Analyzed	3 Sep 88	3 Sep 88	3 Sep 88
Elapsed Time	9 Days	9 Days	9 Days
2nd Column	6 Sep 88	6 Sep 88	6 Sep 88
Elapsed Time	12 Days	12 Days	12 Days
PESTICIDES AND PCBs (SW8080)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION	
Date Extracted	1 Sep 88	1 Sep 88	1 Sep 88
Elapsed Time	7 Days	7 Days	7 Days
Date Analyzed	27 Sep 88	27 Sep 88	27 Sep 88
Elapsed Time	33 Days	33 Days	33 Days
2nd Column	--- ----	---------	---------
Elapsed Time	--- ----	----- ---	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		NO HOLDING TIME SPECIFIED	
Date Extracted	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	25 Days	25 Days	25 Days
Date Analyzed	20 Sep 88	20 Sep 88	20 Sep 88
Elapsed Time	26 Days	26 Days	26 Days

TABLE N-11
(Continued)

	SGA0 0-2 8-16-88 DANGB-3-SS-A0 88081902 88081960	SGA1 0-2 8-16-88 DANGB-3-SS-A1 88081955	SGA2 0-2 8-16-88 DANGB 3-SS-A2 88081959	SGA3 0-2 8-16-88 DANGB-3-SS-A3 88081954	SGA4 0 2 8-16-88 DANGB-3-SS-A4 88081904	SGA4 DUP 0-2 8-17-88 DANGB-3-SS-A4 88081945	SGA5 0-2 8-17-88 DANGB-3-SS-A1 88081946	SGB1 0-2 8-16-88 DANGB-3-SS-B1 88081903 88081961	SGB2 0-2 8-17-88 DANGB-3-SS-B2 88081949	SGB3 0-2 8-16-88 DANGB-3-SS-B3 88081905
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	16 Aug 88	17 Aug 88	16 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	4 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88	4 Oct 88	16 Oct 88	16 Oct 88	4 Oct 88	6 Oct 88	4 Oct 88
Elapsed Time	49 Days	51 Days	51 Days	51 Days	49 Days	60 Days	60 Days	49 Days	50 Days	49 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	7 Sep 88	18 Sep 88	18 Sep 88	7 Sep 88	18 Sep 88	7 Sep 88
Elapsed Time	22 Days	33 Days	33 Days	33 Days	22 Days	32 Days	32 Days	22 Days	32 Days	22 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	7 Sep 88
Elapsed Time	22 Days	31 Days	31 Days	31 Days	22 Days	30 Days	30 Days	22 Days	30 Days	22 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	7 Sep 88
Elapsed Time	22 Days	31 Days	31 Days	31 Days	22 Days	30 Days	30 Days	22 Days	30 Days	22 Days
Lead * (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	23 Sep 88	12 Oct 88	12 Oct 88	12 Oct 88	23 Sep 88	12 Oct 88	12 Oct 88	23 Sep 88	10 Oct 88	23 Sep 88
Elapsed Time	38 Days	57 Days	57 Days	57 Days	38 Days	56 Days	56 Days	38 Days	54 Days	38 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	12 Sep 88	13 Sep 88	13 Sep 88	13 Sep 88	12 Sep 88	13 Sep 88	13 Sep 88	12 Sep 88	13 Sep 88	12 Sep 88
Elapsed Time	27 Days	28 Days	28 Days	28 Days	27 Days	27 Days	27 Days	27 Days	27 Days	27 Days
PERCENT MOISTURE										
Date Analyzed	24 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	24 Aug 88
Elapsed Time	8 Days	13 Days	13 Days	13 Days	8 Days	12 Days	12 Days	8 Days	12 Days	8 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days	10 Days	9 Days	9 Days	10 Days	9 Days	9 Days
Date Analyzed	5 Oct 88	1 Nov 88	28 Nov 88	29 Nov 88	5 Oct 88	5 Oct 88	12 Dec 88	11 Oct 88	28 Nov 88	11 Oct 88
Elapsed Time	40 Days	77 Days	104 Days	105 Days	40 Days	49 Days	117 Days	46 Days	103 Days	56 Days

TABLE N-11
(Continued)

	SSC0 0-2 8-16-88 DANGB-3-SS-C0 88081956	SGC1 0-2 8-16-88 DANGB-3-SS-C1 88081957	SGC2 0-2 8-16-88 DANGB-3-SS-C2 88081901 88081962	SGC3 0-2 8-16-88 DANGB-3-SS-C3 88081958	SGC5 0-2 8-17-88 DANGB-3-SS-C5 88081944	SGD0 0-2 8-18-88 DANGB-3-SS-D0 88081973	SGD1 0-2 8-18-88 DANGB-3-SS-D1 88081975	SGD2 0-2 8-17-88 DANGB-3-SS-D2 88081952	SGD3 0-2 8-30-88 DANGB-3-SGD3-SS1 88082200	SGD3 DUP 0-2 8-30-88 DANGB-3-SGD3-SS1 88082201
Date Collected	16 Aug 88	16 Aug 88	16 Aug 88	16 Aug 88	17 Aug 88	18 Aug 88	18 Aug 88	17 Aug 88	30 Aug 88	30 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	6 Oct 88	6 Oct 88	4 Oct 88	6 Oct 88	16 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88	10 Oct 88	10 Oct 88
Elapsed Time	51 Days	51 Days	49 Days	51 Days	60 Days	49 Days	49 Days	50 Days	41 Days	41 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	18 Sep 88	18 Sep 88	7 Sep 88	18 Sep 88	18 Sep 88	19 Sep 88	19 Sep 88	18 Sep 88	20 Oct 88	20 Oct 88
Elapsed Time	33 Days	33 Days	22 Days	33 Days	32 Days	32 Days	32 Days	32 Days	51 Days	51 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	16 Sep 88	20 Oct 88	20 Oct 88
Elapsed Time	31 Days	31 Days	22 Days	31 Days	30 Days	32 Days	32 Days	30 Days	51 Days	51 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	16 Sep 88	20 Oct 88	20 Oct 88
Elapsed Time	31 Days	31 Days	22 Days	31 Days	30 Days	32 Days	32 Days	30 Days	51 Days	51 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	12 Oct 88	12 Oct 88	23 Sep 88	12 Oct 88	12 Oct 88	11 Oct 88	11 Oct 88	10 Oct 88	20 Oct 88	20 Oct 88
Elapsed Time	57 Days	57 Days	38 Days	57 Days	56 Days	64 Days	64 Days	54 Days	51 Days	51 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	13 Sep 88	13 Sep 88	12 Sep 88	13 Sep 88	13 Sep 88	14 Sep 88	14 Sep 88	13 Sep 88	22 Sep 88	22 Sep 88
Elapsed Time	28 Days	28 Days	27 Days	28 Days	27 Days	27 Days	27 Days	27 Days	23 Days	23 Days
PERCENT MOISTURE										
Date Analyzed	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	7 Sep 88	7 Sep 88
Elapsed Time	13 Days	13 Days	8 Days	13 Days	12 Days	11 Days	11 Days	12 Days	8 Days	8 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	27 Aug 88	2 Nov 88	26 Aug 88	10 Sep 88	10 Sep 88
Elapsed Time	10 Days	10 Days	9 Days	10 Days	9 Days	9 Days	76 Days	9 Days	10 Days	10 Days
Date Analyzed	2 Nov 88	29 Nov 88	11 Oct 88	29 Nov 88	1 Dec 88	28 Nov 88	21 Nov 88	28 Nov 88	19 Oct 88	19 Oct 88
Elapsed Time	78 Days	105 Days	56 Days	105 Days	106 Days	102 Days	95 Days	103 Days	49 Days	49 Days

TABLE N-11
(Continued)

	SGD4 0-2 8-17-88 DANGB-3-SS-D4 88081953	SGD5 0-2 8-17-83 DANGB-3-SS-D5 88081943	SGE0 0-2 8-18-88 DANGB-3-SS-E0 88081976	SGE1 0-2 8-18-88 DANGB-3-SS-E1 88081977	SGE2 0-2 8-18-88 DANGB-3-SS-E2 88081972	SGE3 0-2 8-30 88 DANGB-3-SGE3-SS1 88082202	SGE3 DUP 0-2 8-30-88 DANGB-3-SGE3-SS1 88082203	SGE4 0-2 8-31-88 DANGB-3-SGE4-SS2 88092248	SGE4 DUP 0-2 8-31-88 DANGB-3-SGE4-SS1 88092249	SG49 0-2 8-18-88 DANGB-3-SS-49 88081974
Date Collected	17 Aug 88	17 Aug 88	18 Aug 88	18 Aug 88	18 Aug 88	30 Aug 88	30 Aug 88	31 Aug 88	31 Aug 88	18 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	6 Oct 88	16 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88	10 Oct 88	10 Oct 88	11 Oct 88	11 Oct 88	6 Oct 88
Elapsed Time	50 Days	60 Days	49 Days	49 Days	49 Days	41 Days	41 Days	41 Days	41 Days	49 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	18 Sep 88	18 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sep 88
Elapsed Time	32 Days	32 Days	32 Days	32 Days	32 Days	51 Days	51 Days	50 Days	50 Days	32 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sep 88
Elapsed Time	30 Days	30 Days	32 Days	32 Days	32 Days	51 Days	51 Days	50 Days	50 Days	32 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sep 88
Elapsed Time	30 Days	30 Days	32 Days	32 Days	32 Days	51 Days	51 Days	50 Days	50 Days	32 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	12 Oct 88	12 Oct 88	11 Oct 88	11 Oct 88	11 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	22 Oct 88	11 Oct 88
Elapsed Time	54 Days	56 Days	64 Days	64 Days	64 Days	51 Days	51 Days	50 Days	52 Days	64 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	13 Sep 88	13 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	14 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	27 Days	23 Days	23 Days	22 Days	22 Days	27 Days
PERCENT MOISTURE										
Date Analyzed	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88	7 Sep 88	7 Sep 88	9 Sep 88	9 Sep 88	29 Aug 88
Elapsed Time	12 Days	12 Days	11 Days	11 Days	11 Days	8 Days	8 Days	9 Days	9 Days	11 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	2 Nov 88	27 Aug 88	27 Aug 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	27 Aug 88
Elapsed Time	9 Days	9 Days	76 Days	9 Days	9 Days	10 Days		10 Days	10 Days	9 Days
Date Analyzed	29 Nov 88	28 Nov 88	30 Nov 88	28 Nov 88	28 Nov 88	19 Oct 88	23 Nov 88	24 Oct 88	24 Oct 88	27 Oct 88
Elapsed Time	104 Days	103 Days	104 Days	102 Days	102 Days	49 Days	83 Days	54 Days	54 Days	70 Days

TABLE N-11
(Continued)

	SG54 0-2 8-17-88 DANGB-3-SS-Z2 88081947	SG55 0-2 8-17 88 DANGB-3-SS-A3.5 88081951	SS56 0 2 8-16-88 DANGB-3-SS A3.5 88081906	SG57 0-2 8-17-88 DANGB-3-SS-A2.5 88081950	SG58 0-2 8-17 88 DANGB-3-SS-Y2 88081948	SGC4IR-221 9-27-88 DANGB-SGC4-SS1 R 88092782	SGC4 R-221 DUP* 9 27-88 DANGB-SGC4-SS2 R 88092783	MW25-SS1 0-1 8-26-88 DANGB-3-MW25-SS1 88082146	MW25-SS2 2-3 8-26-88 DANGB-3-MW25-SS2 88082147	MW25-SS3 14-15 8-26-88 DANGB-3-MW25-SS3 88082148
Date Collected	17 Aug 88	17 Aug 88	16 Aug 88	17 Aug 88	17 Aug 88	27 Sep 88	27 Sep 88	26 Aug 88	26 Aug 88	26 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Oct 88	6 Oct 88	4 Oct 88	6 Oct 88	6 Oct 88	17 Oct 88	17 Oct 88	7 Oct 88	7 Oct 88	7 Oct 88
Elapsed Time	60 Days	50 Days	49 Days	50 Days	50 Days	20 Days	20 Days	42 Days	43 Days	43 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	18 Sep 88	18 Sep 88	7 Sep 88	18 Sep 88	18 Sep 88	17 Oct 88	17 Oct 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	32 Days	32 Days	22 Days	32 Days	32 Days	20 Days	20 Days	24 Days	24 Days	24 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	27 Oct 88	27 Oct 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	30 Days	30 Days	22 Days	30 Days	30 Days	30 Days	30 Days	24 Days	24 Days	24 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	16 Sep 88	7 Sep 88	16 Sep 88	16 Sep 88	18 Oct 88	18 Oct 88	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	30 Days	30 Days	22 Days	30 Days	30 Days	21 Days	21 Days	24 Days	24 Days	24 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	12 Oct 88	10 Oct 88	23 Sep 88	10 Oct 88	10 Oct 88	20 Oct 88	25 Oct 88	5 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	56 Days	54 Days	38 Days	54 Days	54 Days	23 Days	28 Days	40 Days	46 Days	46 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	13 Sep 88	13 Sep 88	12 Sep 88	13 Sep 88	13 Sep 88	27 Oct 88	27 Oct 88	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	27 Days	30 Days	30 Days	26 Days	22 Days	22 Days
PERCENT MOISTURE										
Date Analyzed	29 Aug 88	29 Aug 88	24 Aug 88	29 Aug 88	29 Aug 88	10 Oct 88	10 Oct 88	2 Sep 88	2 Sep 88	2 Sep 88
Elapsed Time	12 Days	12 Days	8 Days	12 Days	12 Days	13 Days	13 Days	7 Days	7 Days	7 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	26 Aug 88	7 Oct 88	7 Oct 88	28 Oct 88	28 Oct 88	28 Oct 88
Elapsed Time	9 Days	9 Days	10 Days	9 Days	9 Days	10 Days	10 Days	63 Days	70 Days	70 Days
Date Analyzed	27 Oct 88	28 Nov 88	5 Oct 88	5 Oct 88	28 Nov 88	15 Nov 88	15 Nov 88	2 Nov 88	2 Nov 88	2 Nov 88
Elapsed Time	71 Days	103 Days	50 Days	49 Days	103 Days	49 Days	49 Days	68 Days	68 Days	68 Days

TABLE N-11
(Continued)

	MW27-SS1 0-1 8-24-88 DANGB-3-MW27-SS1 88082102	MW27-SS2 5-6 8-24 88 DANGB-3-MW27-SS2 88072103	MW27-SS3 14-15 8-24-88 DANGB-3-MW27-SS3 88082101	MW28-SS1 0-1 8-27-88 DANGB-3-MW28-SS1 88082158	MW28-SS2 2-3 8-27-88 DANGB-3-MW28-SS2 88082159	MW28-SS3 14-15 8-27-88 DANGB-3-MW28-SS3 88082160	MW29-SS1 0-1 8-30-88 DANGB-3-MW29-SS1 88082196	MW29-SS2 2-4 8-30-88 DANGB-3-MW29-SS2 88082197	MW29-SS3 14-15 8-30-88 DANGB-3-MW29-SS3 88082198	MW29-SS3 DUP 14-15 8-30-88 DANGB-3-MW29-SS3 88082199
Date Collected	26 Aug 88	24 Aug 88	24 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Oct 88	7 Oct 88	7 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88
Elapsed Time	45 Days	45 Days	45 Days	44 Days	44 Days	44 Days	41 Days	41 Days	41 Days	41 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88
Elapsed Time	26 Days	26 Days	26 Days	54 Days	54 Days	54 Days	51 Days	51 Days	51 Days	51 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Oct 88	19 Oct 88	19 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88
Elapsed Time	26 Days	26 Days	26 Days	53 Days	53 Days	53 Days	51 Days	51 Days	51 Days	51 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Oct 88	19 Oct 88	19 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88
Elapsed Time	26 Days	26 Days	26 Days	53 Days	53 Days	53 Days	51 Days	51 Days	51 Days	51 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	4 Oct 88	4 Oct 88	4 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88
Elapsed Time	48 Days	42 Days	48 Days	47 Days	47 Days	47 Days	51 Days	51 Days	51 Days	51 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	20 Sep 88	20 Sep 88	20 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88
Elapsed Time	27 Days	27 Days	27 Days	25 Days	25 Days	25 Days	23 Days	23 Days	23 Days	23 Days
PERCENT MOISTURE										
Date Analyzed	2 Sep 88	2 Sep 88	2 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88
Elapsed Time	7 Days	9 Days	9 Days	11 Days	11 Days	11 Days	8 Days	8 Days	8 Days	8 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	2 Sep 88	2 Sep 88	2 Sep 88	6 Sep 88	6 Sep 88	6 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88
Elapsed Time	9 Days	9 Days	26 Days	10 Days	10 Days	10 Days		11 Days	11 Days	11 Days
Date Analyzed	13 Oct 88	13 Oct 88	18 Oct 88	14 Oct 88	17 Oct 88	17 Oct 88	20 Oct 88	20 Oct 88	30 Nov 88	18 Oct 88
Elapsed Time	50 Days	50 Days	55 Days	48 Days	51 Days	51 Days	40 Days	51 Days	81 Days	48 Days

TABLE N-11
(Continued)

	MW30-SS1 0-1 8-30-88 DANGB-3-MW30-SS1 88082192	MW30-SS1 DUP 0-1 8-30-88 DANGB-3-MW30-SS1 88082193	MW30-SS2 9-11 8-30-88 DANGB-3-MW30-SS2 88082194	MW30-SS3 14-15 8-30-88 DANGB-3-MW30-SS3 88082195	MW31-SS1 0-1 8-27-88 DANGB-3-MW31-SS1 88082156	MW31-SS2 9-10 8-27-88 DANGB-3-MW31-SS2 88082157	MW33-SS1 0-1 8-27-88 DANGB-3-MW33-SS1 88082161	MW33-SS2 11-12 8-27-88 DANGB-3-MW33-SS2 88082162	MW33-SS3 20-21 8-27-88 DANGB-3-MW33-SS1 88082163	MW35-SS1 0-1 8-25-88 DANGB-3-MW35-SS1 88082132
Date Collected	30 Aug 88	30 Aug 88	30 Aug 88	30 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	27 Aug 88	25 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	7 Oct 88
Elapsed Time	41 Days	41 Days	41 Days	41 Days	44 Days	44 Days	44 Days	44 Days	44 Days	43 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Sep 88
Elapsed Time	51 Days	51 Days	51 Days	51 Days	54 Days	54 Days	54 Days	54 Days	54 Days	25 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Sep 88
Elapsed Time	51 Days	51 Days	51 Days	51 Days	53 Days	53 Days	53 Days	53 Days	53 Days	25 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Sep 88
Elapsed Time	51 Days	51 Days	51 Days	51 Days	53 Days	53 Days	53 Days	53 Days	53 Days	25 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	20 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	4 Oct 88
Elapsed Time	51 Days	51 Days	51 Days	51 Days	47 Days	47 Days	47 Days	47 Days	47 Days	40 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed	22 Sep 88	22 Sep 88	22 Sep 88	22 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	23 Days	23 Days	23 Days	23 Days	25 Days	25 Days	25 Days	25 Days	25 Days	27 Days
PERCENT MOISTURE										
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	2 Sep 88
Elapsed Time	8 Days	8 Days	8 Days	8 Days	11 Days	11 Days	11 Days	11 Days	11 Days	8 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	6 Sep 88	6 Sep 88	6 Sep 88	29 Oct 88	29 Oct 88	2 Sep 88
Elapsed Time	11 Days	11 Days	10 Days	10 Days	10 Days	10 Days	10 Days	63 Days	63 Days	8 Days
Date Analyzed	19 Oct 88	30 Nov 88	18 Oct 88	18 Oct 88	14 Oct 88	14 Oct 88	17 Oct 88	30 Nov 88	2 Nov 88	13 Oct 88
Elapsed Time	49 Days	81 Days	48 Days	48 Days	48 Days	48 Days	51 Days	95 Days	67 Days	49 Days

TABLE N-11
(Continued)

	MW35-SS2 2-3 8-25-88 DANGB-3-MW35-SS2 88082131	MW35-SS3 10-11.5 8-25-88 DANGB-3-MW35-SS3 88082133	MW35-SS3 DUP 10-11.5 8-25-88 DANGB-3-MW35-SS3A 88082130
Date Collected	25 Aug 88	25 Aug 88	25 Aug 88
Arsenic (SW7060)		ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	7 Oct 88	7 Oct 88	10 Oct 88
Elapsed Time	43 Days	43 Days	46 Days
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	25 Days	25 Days	25 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	25 Days	25 Days	25 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	25 Days	25 Days	25 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION	
Date Analyzed	4 Oct 88	4 Oct 88	20 Oct 88
Elapsed Time	40 Days	40 Days	56 Days
Mercury (SW7471)		ANALYZE WITHIN 28 DAYS OF COLLECTION	
Date Analyzed	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	27 Days	27 Days	27 Days
PERCENT MOISTURE			
Date Analyzed	2 Sep 88	2 Sep 88	2 Sep 88
Elapsed Time	8 Days	8 Days	8 Days
SEMI-VOLATILE ORGANICS (SW8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION	
Date Extracted	2 Sep 88	2 Sep 88	2 Sep 88
Elapsed Time	8 Days	8 Days	8 Days
Date Analyzed	13 Oct 88	13 Oct 88	13 Oct 88
Elapsed Time	49 Days	49 Days	49 Days

TABLE N-12
Site 3
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Ground-Water Samples

	GW 3-A 9-17-88 DANGB-3-GW3A-GW-1 88092515	GW 3-B 9-17-88 DANGB-3-GW3B-GW-1 88092513	GW 3-B DUP 9-17-88 DANGB-3-MW54-GW-1 88092514	GW 3-C 9-17-88 DANGB-3 GW3C-GW-1 88092511	GW 3 C FB 9-17-88 DANGB-FB11 88092512	GW 3-D 9-17-88 DANGB-3-GW3D-GW-1 88092516	MW25 9-14 88 DANGB-3-MW25-GW-1 88092423	MW26 9-14-88 DANGB-3-MW26-GW-1 88092426	MW26 DUP 9-14-88 DANGB-3-MW53-GW-1 88092427	MW27 9-16-88 DANGB-3-MW27-GW-1 88092487/88092508
Date Collected	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	14 Sep 88	14 Sep 88	14 Sep 83	16 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	20 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	3 Days	10 Days	10 Days	10 Days	10 Days	10 Days	7 Days	7 Days	7 Days	5 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	20 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	27 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88	21 Sep 88
Elapsed Time	3 Days	10 Days	10 Days	10 Days	10 Days	10 Days	7 Days	7 Days	7 Days	5 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
PESTICIDES AND PCB's (EPA 608)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	23 Sep 88	23 Sep 88	23 Sep 88	23 Sep 88	Analysis Not	23 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	Not
Elapsed Time	6 Days	6 Days	6 Days	6 Days	Requested	6 Days	5 Days	5 Days	5 Days	Given
Date Analyzed	24 Oct 88	24 Oct 88	24 Oct 88	24 Oct 88	Analysis Not	24 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	Not
Elapsed Time	37 Days	37 Days	37 Days	37 Days	Requested	37 Days	32 Days	32 Days	31 Days	Given
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	Analysis Not	3 Oct 88	28 Sep 88	28 Sep 88	28 Sep 88	5 Oct 88
Elapsed Time	16 Days	16 Days	16 Days	16 Days	Requested	16 Days	14 Days	14 Days	14 Days	19 Days
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	Analysis Not	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	8 Oct 88
Elapsed Time	18 Days	18 Days	18 Days	18 Days	Requested	18 Days	18 Days	18 Days	18 Days	22 Days

TABLE N-12
(Continued)

	MW28 9-19-88 DANGB-3-MW28-GW-1 88092525	MW29 9-12-88 DANGB-3-MW29-GW-1 88082490/22092355	MW29 FB 9-15-88 DANGB-FB10 88092491	MW30 9-16-88 DANGB-3-MW30-GW-1 88092494	MW31 9-19-88 DANGB-3-MW31-GW-1 88092526	MW33 9-15-88 DANGB-3-MW33-GW-1 88092488	MW34 9-16-88 DANGB-3-MW34-GW-1 88092495	MW35 9-19-88 DANGB-3-MW35-GW-1 88092527	MW35 FB 9-19-88 DANGB-FB12 88092531	TB1 9-15-88 DANGB-TB7 68092489
Data Collected	19 Sep 88	12 Sep 88	15 Sep 88	16 Sep 88	19 Sep 88	15 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	15 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	21 Sep 88	20 Sep 88	26 Sep 88	20 Sep 88	23 Sep 88	21 Sep 88	20 Sep 88	27 Sep 88	27 Sep 88	21 Sep 88
Elapsed Time	2 Days	8 Days	11 Days	4 Days	4 Days	6 Days	4 Days	8 Days	8 Days	6 Days
2nd Column	--------	16 Sep 88	--------	--------	27 Sep 88	--------	--------	--------	--------	--------
Elapsed Time	--------	4 Days	--------	--------	8 Days	--------	--------	--------	--------	--------
AROMATIC VOLATILE ORGANICS (SW8020)		ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	21 Sep 88	20 Sep 88	26 Sep 88	20 Sep 88	23 Sep 88	21 Sep 88	20 Sep 88	27 Sep 88	Not Given	21 Sep 88
Elapsed Time	2 Days	8 Days	11 Days	4 Days	4 Days	6 Days	4 Days	8 Days		6 Days
2nd Column	--------	--------	--------	--------	--------	--------	--------	--------	Not Given	--------
Elapsed Time	--------	--------	--------	--------	--------	--------	--------	--------		--------
PESTICIDES AND PCBs (EPA 608)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Analyzed	22 Sep 88	22 Sep 88	Analysis Not Requested	23 Sep 88	23 Sep 88	22 Sep 88	23 Sep 88	23 Sep 88	Analysis Not Requested	Analysis Not Requested
Elapsed Time	3 Days	10 Days		7 Days	4 Days	7 Days	7 Days	4 Days		
2nd Column	16 Oct 88	16 Oct 88	Analysis Not Requested	16 Oct 88	24 Oct 88	16 Oct 88	16 Oct 88	24 Oct 88	Analysis Not Requested	Analysis Not Requested
Elapsed Time	27 Days	34 Days		30 Days	35 Days	31 Days	30 Days	35 Days		
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Analyzed	5 Oct 88	Not Given	Analysis Not Requested	29 Sep 88	5 Oct 88	Missing Data	29 Sep 88	5 Oct 88	Analysis Not Requested	Analysis Not Requested
Elapsed Time	16 Days			13 Days	16 Days		13 Days	16 Days		
2nd Column	8 Oct 88	Not Given	Analysis Not Requested	6 Oct 88	8 Oct 88	Missing Data	6 Oct 88	8 Oct 88	Analysis Not Requested	Analysis Not Requested
Elapsed Time	19 Days			20 Days	19 Days		20 Days	19 Days		

TABLE N-12
(Continued)

	TB2 9-16-88 DANGB-TB8 88092493	TB3 9-19-88 DANGB-TB9 88092532	TB4 9-07-88 DANGB-TB9 88092356	BR1 9-16-88 DANGB-BR7 88092492/88092529	BR2 9-19-88 DANGB-BR8 88092528	BR3 9-14-88 DANGB-BR6 88092425
Data Collected	16 Sep 88	19 Sep 88	7 Sep 88	16 Sep 88	19 Sep 88	14 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	23 Sep 88	23 Sep 88	20 Sep 88	21 Sep 88	Not	21 Sep 88
Elapsed Time	7 Days	4 Days	13 Days	5 Days	Given	7 Days
2nd Column	---------	---------	21 Sep 88	---------	Not	---------
Elapsed Time	---------	---------	14 Days	---------	Given	---------
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	23 Sep 88	Not	20 Sep 88	21 Sep 88	23 Sep 88	21 Sep 88
Elapsed Time	7 Days	Given	13 Days	5 Days	4 Days	7 Days
2nd Column	---------	Not	---------	---------	---------	---------
Elapsed Time	---------	Given	---------	---------	---------	---------
PESTICIDES AND PCBs (EPA 608)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION			
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	Not	23 Sep 88	19 Sep 88
Elapsed Time	Requested	Requested	Requested	Given	4 Days	5 Days
2nd Column	Analysis Not	Analysis Not	Analysis Not	Not	24 Oct 88	16 Oct 88
Elapsed Time	Requested	Requested	Requested	Given	35 Days	32 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION			
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	5 Oct 88	5 Oct 88	28 Sep 88
Elapsed Time	Requested	Requested	Requested	19 Days	16 Days	14 Days
2nd Column	Analysis Not	Analysis Not	Analysis Not	8 Oct 88	8 Oct 88	5 Oct 88
Elapsed Time	Requested	Requested	Requested	21 Days	19 Days	21 Days

TABLE N-12
(Continued)

	GW 3-A 9-17-88 DANGB-3-GW3A-GW-1 88092515	GW 3-B 9-17-88 DANGB-3 GW3B-GW-1 88092513	GW 3-B DUP 9-17-88 DANGB-3-MW54-GW-1 88092514	GW 3-C 9-17-88 DANGB-3-GW3C-GW-1 88092511	GW 3-C FB 9-17-88 DANGB-FB11 88092512	GW 3-D 9-17-88 DANGB-3-GW3D GW-1 88092516	MW25 9-14-88 DANGB-3-MW25 GW-1 88092423	MW26 9-14-88 DANGB-3-MW26-GW-1 88092426	MW26 DUP 9-14-88 DANGB-3-MW53 GW-1 88092427	MW27 9-16-88 DANGB-3-MW27-GW-1 88092487/88092508
Date Collected	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	17 Sep 88	14 Sep 88	14 Sep 88	14 Sep 88	16 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	15 Oct 88	15 Oct 88	15 Oct 88	15 Oct 88	Analysis Not	Missing	26 Oct 88	26 Oct 88	26 Oct 88	15 Oct 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days	Requested	Data	42 Days	42 Days	42 Days	29 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not	13 Oct 88	20 Oct 88	20 Oct 88	20 Oct 88	13 Oct 88
Elapsed Time	26 Days	26 Days	26 Days	26 Days	Requested	26 Days	36 Days	36 Days	36 Days	27 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	26 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88	Analysis Not	26 Oct 88	24 Oct 88	24 Oct 88	24 Oct 88	20 Oct 88
Elapsed Time	39 Days	39 Days	39 Days	39 Days	Requested	39 Days	40 Days	40 Days	40 Days	34 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	16 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	Analysis Not	26 Oct 88	1 Nov 88	1 Nov 88	1 Nov 88	16 Oct 88
Elapsed Time	29 Days	29 Days	29 Days	29 Days	Requested	39 Days	48 Days	48 Days	48 Days	30 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	16 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	Analysis Not	16 Oct 88	26 Oct 88	26 Oct 88	26 Oct 88	16 Oct 88
Elapsed Time	29 Days	29 Days	29 Days	29 Days	Requested	29 Days	42 Days	42 Days	42 Days	30 Days
Mercury (SW7470)	ANALYZE WITHIN 28 DAYS OF COLLECTION									
Date Analyzed	14 Oct 88	14 Oct 88	14 Oct 88	14 Oct 88	Analysis Not	Missing	7 Oct 88	7 Oct 88	7 Oct 88	14 Oct 88
Elapsed Time	27 Days	27 Days	27 Days	27 Days	Requested	Data	23 Days	23 Days	23 Days	28 Days
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	24 Sep 88	24 Sep 88	24 Sep 88	23 Sep 88	Analysis Not	24 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	23 Sep 88
Elapsed Time	7 Days	7 Days	7 Days	6 Days	Requested	7 Days	5 Days	5 Days	5 Days	7 Days
Date Analyzed	4 Nov 88	31 Oct 88	31 Oct 88	30 Oct 88	Analysis Not	1 Nov 88	29 Nov 88	29 Nov 88	23 Nov 88	30 Oct 88
Elapsed Time	48 Days	44 Days	44 Days	43 Days	Requested	48 Days	77 Days	77 Days	71 Days	44 Days

TABLE N-12
(Continued)

	MW28 9-19-88 DANGB-3-MW28-GW-1 88092525	MW29 9-12 88 DANGB-3-MW29 GW-1 88082490/88092355	MW29 FB 9-15-88 DANGB-FB10 88092491	MW30 9-16-88 DANGB-3-MW30 GW-1 88092494	MW31 9-19-88 DANGB-3-MW31-GW-1 88092526	MW33 9-15-88 DANGB-3-MW33-GW-1 88092488	MW34 9-16-88 DANGB-3-MW34-GW-1 88092495	MW35 9-19-88 DANGB-3-MW35-GW-1 88092527	MW35 FB 9-19-88 DANGB-FB12 88092531	TB1 9-15-88 DANGB-TB7 88092489
Date Collected	19 Sep 88	12 Sep 88	15 Sep 88	16 Sep 88	19 Sep 88	15 Sep 88	16 Sep 88	19 Sep 88	19 Sep 88	15 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	15 Oct 88	Not	Analysis Not	15 Oct 88	15 Oct 88	15 Oct 88	15 Oct 88	16 Oct 88	Analysis Not	Analysis Not
Elapsed Time	26 Days	Given	Requested	29 Days	26 Days	30 Days	29 Days	27 Days	Requested	Requested
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	13 Oct 88	19 Oct 88	Analysis Not	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	Analysis Not	Analysis Not
Elapsed Time	24 Days	37 Days	Requested	27 Days	24 Days	28 Days	27 Days	24 Days	Requested	Requested
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	26 Oct 88	24 Oct 88	Analysis Not	20 Oct 88	26 Oct 88	20 Oct 88	20 Oct 88	26 Oct 88	Analysis Not	Analysis Not
Elapsed Time	37 Days	42 Days	Requested	34 Days	37 Days	35 Days	34 Days	37 Days	Requested	Requested
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	16 Oct 88	2 Nov 88	Analysis Not	16 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	16 Oct 88	Analysis Not	Analysis Not
Elapsed Time	27 Days	51 Days	Requested	30 Days	27 Days	27 Days	30 Days	27 Days	Requested	Requested
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	21 Oct 88	26 Oct 88	Analysis Not	16 Oct 88	21 Oct 88	16 Oct 88	16 Oct 88	21 Oct 88	Analysis Not	Analysis Not
Elapsed Time	32 Days	44 Days	Requested	30 Days	32 Days	31 Days	30 Days	32 Days	Requested	Requested
Mercury (SW7470)	ANALYZE WITHIN 28 DAYS OF COLLECTION									
Date Analyzed	14 Oct 88	Not	Analysis Not	14 Oct 88	14 Oct 88	14 Oct 88	14 Oct 88	14 Oct 88	Analysis Not	Analysis Not
Elapsed Time	28 Days	Given	Requested	28 Days	26 Days	29 Days	28 Days	25 Days	Requested	Requested
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	22 Sep 88	22 Sep 88	Analysis Not	23 Sep 88	24 Sep 88	22 Sep 88	23 Sep 88	24 Sep 88	Analysis Not	Analysis Not
Elapsed Time	3 Days	10 Days	Requested	7 Days	5 Days	37 Days	7 Days	5 Days	Requested	Requested
Date Analyzed	29 Oct 88	29 Oct 88	Analysis Not	30 Oct 88	31 Sep 88	29 Oct 88	30 Oct 88	31 Oct 88	Analysis Not	Analysis Not
Elapsed Time	40 Days	47 Days	Requested	44 Days	12 Days	44 Days	44 Days	42 Days	Requested	Requested

TABLE N-12
(Continued)

	TB2 9-16-88 DANGB-TB8 88092493	TB3 9-19-88 DANGB-TB9 88092532	TB4 9-07-88 DANGB-TB9 88092356	BR1 9-16-88 DANGB-BR7 88092492/88092529	BR2 9-19-88 DANGB-BR8 88092528	BR3 9-14-88 DANGB-BR6 88092425
Date Collected	16 Sep 88	19 Sep 88	7 Sep 88	16 Sep 88	19 Sep 88	14 Sep 88
Arsenic (SW7060)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	15 Oct 88	15 Oct 88	26 Oct 88
Elapsed Time	Requested	Requested	Requested	29 Days	26 Days	42 Days
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	13 Oct 88	13 Oct 88	20 Oct 88
Elapsed Time	Requested	Requested	Requested	27 Days	24 Days	36 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	20 Oct 88	26 Oct 88	24 Oct 88
Elapsed Time	Requested	Requested	Requested	34 Days	37 Days	40 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	16 Oct 88	16 Oct 88	1 Nov 88
Elapsed Time	Requested	Requested	Requested	30 Days	27 Days	47 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	16 Oct 88	21 Oct 88	26 Oct 88
Elapsed Time	Requested	Requested	Requested	30 Days	32 Days	42 Days
Mercury (SW7470)	ANALYZE WITHIN 28 DAYS OF COLLECTION					
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	14 Oct 88	14 Oct 88	7 Oct 88
Elapsed Time	Requested	Requested	Requested	28 Days	25 Days	23 Days
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted	Analysis Not	Analysis Not	Analysis Not	Missing	24 Sep 88	19 Sep 88
Elapsed Time	Requested	Requested	Requested	Data	5 Days	
Date Analyzed	Analysis Not	Analysis Not	Analysis Not	Missing	31 Oct 88	28 Oct 88
Elapsed Time	Requested	Requested	Requested	Data	42 Days	44 Days

TABLE N-13
Site 4
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Surface Water Samples

	SL11 9-23-88 DANGB-4-SL11-SW-1 88092680	SL12 9-23-88 DANGB-4-SL12-SW-1 88092679	SL13 9-24-88 DANGB-4-SL13-SW-1 88092719	SL13 DUP 9-24-88 DANGB-4-SL26-SW-1 88092720	SL14 9-24-88 DANGB-4-SL14-SW-1 88092723	SL14 FB 9-24 88 DANGB-FB17 88092728	SL15 9-24-88 DANGB-4-SL15-SW-1 88092722	SL16 9-27-88 DANGB-4-SL16-SW-1 880/2777	TB1 9-27-88 DANGB-TB16 88092776
Date Collected	23 Sep 88	23 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	27 Sep 88	16 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Sep 88	29 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	3 Oct 88	5 Oct 88
Elapsed Time	7 Days	6 Days	6 Days	6 Days	6 Days	6 Days	6 Days	6 Days	19 Days
2nd Column	28 Sep 88	28 Sep 88	29 Sep 88	29 Sep 88	29 Sep 88	4 Oct 88	29 Sep 88	30 Sep 88	7 Oct 88
Elapsed Time	5 Days	5 Days	5 Days	5 Days	5 Days	10 Days	5 Days	3 Days	21 Days
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION								
Date Analyzed	30 Sep 88	29 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	30 Sep 88	3 Oct 88	5 Oct 88
Elapsed Time	7 Days	6 Days	6 Days	6 Days	6 Days	6 Days	6 Days	6 Days	19 Days
2nd Column	28 Sep 88	--------	29 Sep 88	29 Sep 88	--------	--------	29 Sep 88	30 Sep 88	7 Oct 88
Elapsed Time	5 Days	--------	5 Days	5 Days	--------	--------	5 Days	3 Days	21 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	8 Oct 88	8 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	Analysis Not	10 Oct 88	12 Oct 88	Analysis Not
Elapsed Time	15 Days	15 Days	16 Days	16 Days	16 Days	Requested	16 Days	15 Days	Requested
Date Analyzed	20 Oct 88	20 Oct 88	12 Oct 88	12 Oct 88	12 Oct 88	Analysis Not	12 Oct 88	21 Oct 88	Analysis Not
Elapsed Time	27 Days	27 Days	18 Days	18 Days	18 Days	Requested	18 Days	24 Days	Requested

TABLE N-13
(Continued)

	SL11 9-23-88 DANGB-4-SL11-SW-1 88092680	SL12 9-23-88 DANGB-4-SL12-SW-1 88092679	SL13 9-24-88 DANGB-4-SL13-SW-1 88092719	SL13 DUP 9-24-88 DANGB-4-SL26-SW-1 88092720	SL14 9-26-88 DANGB-4-SL14-SW-1 88092723/88092771	SL14 FB 9-24-88 DANGB-FB17 88092728	SL15 9-24-88 DANGB-4-SL15-SW-1 88092722	SL16 9-27-88 DANGB-4-SL16-SW-1 88092777	TB1 9-27-88 DANGB-TB16 88092776
Date Collected	23 Sep 88	23 Sep 88	24 Sep 88	24 Sep 88	26 Sep 88	24 Sep 88	24 Sep 88	27 Sep 88	27 Sep 88
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	13 Oct 88 20 Days	13 Oct 88 20 Days	13 Oct 88 19 Days	21 Oct 88 27 Days	21 Oct 88 25 Days	Analysis Not Requested	21 Oct 88 27 Days	2 Nov 88 36 Days	Analysis Not Requested
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	26 Oct 88 33 Days	26 Oct 88 33 Days	27 Oct 88 33 Days	27 Oct 88 33 Days	31 Oct 88 35 Days	Analysis Not Requested	27 Oct 88 33 Days	31 Oct 88 34 Days	Analysis Not Requested
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	19 Oct 88 26 Days	19 Oct 88 26 Days	21 Oct 88 27 Days	21 Oct 88 27 Days	21 Oct 88 25 Days	Analysis Not Requested	21 Oct 88 27 Days	22 Oct 88 25 Days	Analysis Not Requested
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	24 Oct 88 31 Days	24 Oct 88 31 Days	22 Oct 88 28 Days	22 Oct 88 28 Days	24 Oct 88 28 Days	Analysis Not Requested	22 Oct 88 28 Days	22 Oct 88 25 Days	Analysis Not Requested
SEMI-VOLATILE ORGANICS (EPA 625)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	3 Oct 88 4 Days	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	11 Nov 88 45 Days	Analysis Not Requested

TABLE N-14
Site 4
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Sediment Samples

	SL11 9-23-88 DANGB-4-SL11-SD-1 88092675	SL12 9-23 88 DANGB-4-SL12-SD-1 88092676	SL13 9-24-88 DANGB-4-SL13-SD-1 88092738	SL13 DUP 9-24-88 DANGB-4-SL26-SD-1 88092741	SL14 9-24 88 DANGB-4-SL14-SD-1 88092740	SL15 9-24-88 DANGB-4-SL15-SD-1 88092739	SL16 9-27-88 DANGB-4-SL16-SD-1 88092781
Date Collected	23 Sep 88	23 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	27 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed	4 Oct 88	4 Oct 88	9 Oct 88	7 Oct 88	5 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	11 Days	13 Days	15 Days	13 Days	11 Days	12 Days	9 Days
2nd Column	6 Oct 88	6 Oct 88	7 Oct 88	7 Oct 88	6 Oct 88	7 Oct 88	6 Oct 88
Elapsed Time	13 Days	11 Days	13 Days	13 Days	12 Days	13 Days	9 Days
AROMATIC VOLATILE ORGANICS (SW8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed	4 Oct 88	4 Oct 88	7 Oct 88	7 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	11 Days	11 Days	13 Days	13 Days	12 Days	12 Days	9 Days
2nd Column	6 Oct 88	6 Oct 88	7 Oct 88	7 Oct 88	--------	7 Oct 88	--------
Elapsed Time	13 Days	13 Days	13 Days	13 Days	--------	13 Days	--------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION						
Date Extracted	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88	18 Oct 88
Elapsed Time	20 Days	20 Days	19 Days	19 Days	19 Days	19 Days	21 Days
Date Analyzed	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88	25 Oct 88
Elapsed Ti-	29 Days	29 Days	28 Days	28 Days	28 Days	28 Days	28 Days

TABLE N-14
(Continued)

	SL11 9-23-88 DANGB-4-SL11-SD-1 88092675	SL12 9-23-88 DANGB-4-SL12-SD-1 88092676	SL13 9-24-88 DANGB-4-SL13-SD-1 88092738	SL13 DUP 9-24-88 DANGB-4-SL26-SD-1 88092741	SL14 9-24-88 DANGB-4-SL14-SD-1 88092740	SL15 9-24-88 DANGB-4-SL15-SD-1 88092739	SL16 9-27-88 DANGB-4-SL16-SD-1 88092781
Date Collected	23 Sep 88	23 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	27 Sep 88
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION						
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	24 Days	24 Days	23 Days	23 Days	23 Days	23 Days	20 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION						
Date Analyzed	17 Oct 88	27 Oct 88	27 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88	19 Oct 88
Elapsed Time	24 Days	34 Days	33 Days	25 Days	25 Days	25 Days	22 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION						
Date Analyzed	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88
Elapsed Time	25 Days	25 Days	24 Days	24 Days	24 Days	24 Days	21 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION						
Date Analyzed	16 Oct 88	16 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88	18 Oct 88
Elapsed Time	23 Days	23 Days	24 Days	24 Days	24 Days	24 Days	21 Days
PERCENT MOISTURE							
Date Analyzed	13 Oct 88	13 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88
Elapsed Time	20 Days	20 Days	16 Days	16 Days	16 Days	16 Days	13 Days

TABLE N-15
Site 4
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Soil Samples

	MW21-SS1 0-1 8-20-88 DA [illegible] MW21-SS1 88082046	MW21-SS2 5-7 8-20-88 DANGB-4-MW21-SS2 88082047	MW21-SS2 DUP 5-7 8-20-88 DANGB-4-MP21-SS2 88082049	MW21-SS3 18-19 8-20-88 DANGB-4-MW21-SS3 88082048	MW22-SS1 0-1 8-20-88 DANGB-4-MW22-SS1 88082043	MW22-SS2 5-7 8-20-88 DANGB-4-MW22-SS2 88082044	MW22-SS3 30-31 8-20-88 DANGB-4-MW22-SS3 88082045	MW23-SS1 0-1 8-19-88 DANGB-4-MW23-SS1 88082000	MW23-SS2 8-9 8-19-88 DANGB-4-MW23-SS2 88082001	MW23-SS3 30-31 8-19-88 DANGB-4-MW23-SS3 88082002
Date Collected	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	1 Sep 88	1 Sep 88	1 Sep 88	1 Sep 88	31 Aug 88	31 Aug 88	1 Sep 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	12 Days	12 Days	12 Days	12 Days	11 Days	11 Days	12 Days	12 Days	12 Days	12 Days
2nd Column	2 Sep 88	2 Sep 88	2 Sep 88	2 Sep 88	2 Sep 88	2 Sep 88	2 Sep 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days	13 Days	13 Days	13 Days	12 Days	12 Days	12 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	1 Sep 88	1 Sep 88	1 Sep 88	1 Sep 88	31 Aug 88	31 Aug 88	1 Sep 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	12 Days	12 Days	12 Days	12 Days	11 Days	11 Days	12 Days	12 Days	12 Days	12 Days
2nd Column	1 Sep 88	1 Sep 88	1 Sep 88	1 Sep 88	31 Aug 88	31 Aug 88	1 Sep 88	31 Aug 88	31 Aug 88	31 Aug 88
Elapsed Time	12 Days	12 Days	12 Days	12 Days	11 Days	11 Days	12 Days	12 Days	12 Days	12 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	30 Aug 88	31 Aug 88	30 Aug 88	30 Aug 88	31 Aug 88	30 Aug 88	30 Aug 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	10 Days	11 Days	10 Days	10 Days	11 Days	10 Days	10 Days			
Date Analyzed	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	3 Oct 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	44 Days	44 Days	44 Days	44 Days	44 Days	44 Days	44 Days			
2nd Column	3 Oct 88	....	....	....	....	....	....	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	44 Days	....	....	....	....	....	....			
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED							
Date Extracted	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88
Elapsed Time	26 Days	26 Days	26 Days	26 Days	26 Days	26 Days	26 Days	27 Days	27 Days	27 Days
Date Analyzed	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88	15 Sep 88
Elapsed Time	26 Days	26 Days	26 Days	26 Days	26 Days	26 Days	26 Days	27 Days	27 Days	27 Days

TABLE N-15
(Continued)

	MW24-SS1 0-2 8-24-88 DANGB-4-MW24-SS1 88082099	MW24-R SS1 0-2 8-31-88 DANGB-4 MW24-SS1 88092254	MW24 R-SS1 DUP 0-2 8-31-88 DANGB-4-MW24-SS1A 88092255	MW24-SS2 3-4 8-24-88 DANGB-4-MW24-SS2 88082100	MW24-SS3 32-34 8-24-88 DANGB-4-MW24-SS3 88082101
Date Collected	24 Aug 88	31 Aug 88	31 Aug 88	24 Aug 88	24 Aug 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	1 Sep 88	13 Sep 88	13 Sep 88	1 Sep 88	1 Sep 88
Elapsed Time	8 Days	13 Days	13 Days	8 Days	8 Days
2nd Column	2 Sep 88	12 Sep 88	12 Sep 88	2 Sep 88	2 Sep 88
Elapsed Time	9 Days	12 Days	12 Days	9 Days	9 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION		
Date Analyzed	1 Sep 88	13 Sep 88	13 Sep 88	1 Sep 88	1 Sep 88
Elapsed Time	8 Days	13 Days	13 Days	8 Days	8 Days
2nd Column	1 Sep 88	12 Sep 88	12 Sep 88	1 Sep 88	2 Sep 88
Elapsed Time	8 Days	12 Days	12 Days	8 Days	9 Days
PESTICIDES AND PCB's (SW8080)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION		
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			NO HOLDING TIME SPECIFIED		
Date Extracted	17 Sep 88	22 Sep 88	22 Sep 88	17 Sep 88	17 Sep 88
Elapsed Time	24 Days	22 Days	22 Days	24 Days	24 Days
Date Analyzed	19 Sep 88	23 Sep 88	23 Sep 88	19 Sep 88	19 Sep 88
Elapsed Time	26 Days	23 Days	23 Days	26 Days	26 Days

TABLE N-15
(Continued)

	MW21-SS1 0-1 8-20-88 DANGB-4-MW21-SS1 88082046	MW21-SS2 5-7 8-20-88 DANGB-4-MW21-SS2 88082047	MW21-SS2 DUP 5-7 8-20 88 DANGB-4-MP21-SS2 88082019	MW21-SS3 18-19 8-20 88 DANGB-4-MW21-SS3 88082018	MW22-SS1 0-1 8-20-88 DAN[illegible]-4-MW22-SS1 88082[illegible]3	MW22-SS2 5-7 8-20-88 DANGB-4-MW22-SS2 88082044	MW22-SS3 30-31 8-20-88 DANGB-4-MW22-SS3 88082045	MW23-SS1 0-1 8-19-88 DANGB-4-MW23-SS1 88082000	MW23-SS2 8-9 8-19-88 DANGB-4-MW23-SS2 88082001	MW23-SS3 30-31 8-19 88 DANGB-4-MW23-SS3 88082002
Date Collected	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	19 Aug 88	19 Aug 88	19 Aug 88
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88
Elapsed Time	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	28 Days	28 Days	28 Days
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	19 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88
Elapsed Time	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	30 Days	28 Days	28 Days	28 Days
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	5 Oct 88	22 Sep 88	22 Sep 88	22 Sep 88
Elapsed Time	46 Days	46 Days	46 Days	46 Days	46 Days	46 Days	46 Days	34 Days	34 Days	34 Days
PERCENT MOISTURE										
Date Analyzed	2 Sep 88	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	31 Aug 88	29 Aug 88	29 Aug 88	29 Aug 88
Elapsed Time	13 Days	11 Days	11 Days	11 Days	11 Days	11 Days	11 Days	10 Days	10 Days	10 Days

TABLE N-15
(Continued)

	MW24-SS1 0-2 8-24-88 DANGB-4-MW24-SS1 88082099	MW24 R-SS1 0-2 8-31-88 DANGB-4-MW24-SS1 88092254	MW24 R-SS1 DUP 0-2 8-31-88 DANGB-4-MW24-SS1A 88092255	MW24-SS2 3-4 8-24-88 DANGB-4-MW24-SS2 88082100	MW24-SS3 32-34 8-24-88 DANGB-4-MW24-SS3 88082101
Date Collected	24 Aug 88	31 Aug 88	31 Aug 88	24 Aug 88	24 Aug 88
Barium (SW6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	19 Sep 88	20 Oct 88	20 Oct 88	19 Sep 88	19 Sep 88
Elapsed Time	26 Days	50 Days	50 Days	26 Days	26 Days
Cadmium (SW7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	19 Sep 88	20 Oct 88	20 Oct 88	19 Sep 88	19 Sep 88
Elapsed Time	26 Days	50 Days	50 Days	26 Days	26 Days
Chromium (SW7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	19 Sep 88	20 Oct 88	20 Oct 88	19 Sep 88	19 Sep 88
Elapsed Time	25 Days	50 Days	50 Days	26 Days	26 Days
Lead (SW7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	4 Oct 88	20 Oct 88	20 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	41 Days	50 Days	50 Days	41 Days	41 Days
PERCENT MOISTURE					
Date Analyzed	2 Sep 88	9 Sep 88	9 Sep 88	2 Sep 88	2 Sep 88
Elapsed Time	9 Days	9 Days	9 Days	9 Days	9 Days

TABLE N-16
Site 4
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Ground-Water Samples

	MW 8	MW 9	MW 9 FB	MW 10	MW 11	GW 4-A	GW 4-B	GW 4-C	GW 4-C DUP	GW 4-C FB
	9-13-88	9-12-88	9-12-88	9-14-88	9-14-88	9-13-88	9-12-88	9-12-88	9-12-8[illegible]	9-12-88
	DANGB-4-MW8-GW-1	DANGB-4-MW9-GW-1	DANGB-FB8	DANGB-4-MW10-GW-1	DANGB-4-MW11-GW-1	DANGB-4-GW4A-GW-1	DANGB-4-GW4B-GW-1	DANGB-4-GW4C-GW-1	DANGB-4-MW52 [illegible]-1	DANGB-FB7
	88092390	88092348	88092353	88092422	88092424	88092388	88092349	88092509	88092510	88092352
Date Collected	13 Sep 88	12 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	13 Sep 88	12 Sep 88	16 Sep 88	16 Sep 88	12 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	20 Sep 88	15 Sep 88	21 Sep 88	21 Sep 88	16 Sep 88	20 Sep 88	21 Sep 88	21 Sep 8[illegible]	15 Sep 88
Elapsed Time	3 Days	8 Days	3 Days	7 Days	7 Days	3 Days	8 Days	5 Days	5 Days	3 Days
2nd Column	19 Sep 88	16 Sep 88	19 Sep 88	---------	---------	19 Sep 88	16 Sep 88	---------	---------	19 Sep 88
Elapsed Time	6 Days	4 Days	7 Days	---------	---------	6 Days	4 Days	---------	---------	7 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	20 Sep 88	15 Sep 88	21 Sep 88	21 Sep 88	16 Sep 88	20 Sep 88	21 Sep 88	21 Sep 88	15 Sep 88
Elapsed Time	3 Days	8 Days	3 Days	7 Days	7 Days	3 Days	8 Days	5 Days	5 Days	3 Days
2nd Column	---------	16 Sep 88	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	4 Days	---------	---------	---------	---------	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	23 Sep 88	28 Sep 88	Analysis Not	28 Sep 88	28 Sep 88	23 Sep 88	28 Sep 88	28 Sep 88	28 Sep 88	Analysis Not
Elapsed Time	10 Days	16 Days	Requested	14 Days	14 Days	10 Days	16 Days	12 Days	12 Days	Requested
Date Analyzed	26 Sep 88	5 Oct 88	Analysis Not	5 Oct 88	5 Oct 88	26 Sep 88	5 Oct 88	5 Oct 88	5 Oct 88	Analysis Not
Elapsed Time	13 Days	23 Days	Requested	21 Days	21 Days	13 Days	23 Days	19 Days	19 Days	Requested

TABLE N-16
(Continued)

	GW 4-D 9-13-88 DANGB-4-GW4D-GW-1 88092389	MW21 9-10-88 DANGB-4-MW21-GW-1 88092321	MW22 9-10 88 DANGB-4-MW22 GW-1 88092325	MW22 FB 9-10 88 DANGB-FB6	MW23 9-10-88 DANGB-4-MW23-GW-1 88092312	MW24 9-10 88 DANGB-4-MW24 GW-1 88092322	TB1 9-12-88 DANGB-TB4 88092351	TB2 9-13-88 DANGB-TB6 88092391	BR1 9-12-88 DANGB-BR4 88092350	BR2 9-12-88 DANGB-BR5 88092354
Date Collected	13 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	12 Sep 88	13 Sep 88	12 Sep 88	12 Sep 88
HALOGENATED VOLATILE ORGANICS (SW8010)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	20 Sep 88	Not	16 Sep 88	16 Sep 88	15 Sep 88	20 Sep 88	15 Sep 88	20 Sep 88
Elapsed Time	3 Days	6 Days	10 Days	Given	6 Days	6 Days	3 Days	7 Days	3 Days	8 Days
2nd Column	19 Sep 88	15 Sep 88	15 Sep 88	Not	14 Sep 88	15 Sep 88	19 Sep 88	16 Sep 88	19 Sep 88	21 Sep 88
Elapsed Time	6 Days	5 Days	5 Days	Given	4 Days	5 Days	7 Days	3 Days	7 Days	9 Days
AROMATIC VOLATILE ORGANICS (SW8020)			ANALYZE WITHIN 14 DAYS OF COLLECTION							
Date Analyzed	16 Sep 88	16 Sep 88	20 Sep 88	Not	16 Sep 88	16 Sep 88	15 Sep 88	20 Sep 88	15 Sep 88	20 Sep 88
Elapsed Time	3 Days	6 Days	10 Days	Given	6 Days	6 Days	3 Days	7 Days	3 Days	8 Days
2nd Column	---------	15 Sep 88	---------	Not	---------	15 Sep 88	---------	---------	---------	---------
Elapsed Time	---------	5 Days	---------	Given	---------	5 Days	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)			EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION							
Date Extracted	23 Sep 88	29 Sep 88	29 Sep 88	Analysis Not	28 Sep 88	29 Sep 88	Analysis Not	Analysis Not	28 Sep 88	28 Sep 88
Elapsed Time	10 Days	19 Days	19 Days	Requested	18 Days	19 Days	Requested	Requested	16 Days	16 Days
Date Analyzed	26 Sep 88	5 Oct 88	5 Oct 88	Analysis Not	5 Oct 88	5 Oct 88	Analysis Not	Analysis Not	5 Oct 88	5 Oct 88
Elapsed Time	13 Days	25 Days	25 Days	Requested	25 Days	25 Days	Requested	Requested	23 Days	23 Days

TABLE N-16
(Continued)

	MW 8 9-13-88 DANGB-4-MW8-GW-1 88092390	MW 9 9-12-88 DANGB-4-MW9-GW-1 88092348	MW 9 FB 9-12-88 DANGB-FB8 88092353	MW 10 9-14-88 DANGB-4-MW10-GW-1 88092422	MW 11 9-14-88 DANGB-4-MW11-GW-1 88092424	GW 4-A 9-13 88 DANGB-4-GW4A-GW-1 88092388	GW 4-B 9-12-88 DANGB-4-GW4B-GW-1 88092349	GW 4-C 9-12-88 DANGB-4-GW4C-GW-1 88092509	GW 4-C DUP 9-12-88 DANGB-4-MW52-GW-1 88092510	GW 4-C FB 9-12-88 DANGB-FB7 88092352
Date Collected	13 Sep 88	12 Sep 88	12 Sep 88	14 Sep 88	14 Sep 88	13 Sep 88	12 Sep 88	12 Sep 88	12 Sep 88	12 Sep 88
Barium (SW6010)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	19 Oct 88	9 Oct 88	Analysis Not	20 Oct 88	20 Oct 88	19 Oct 88	9 Oct 88	13 Oct 88	13 Oct 88	Analysis Not
Elapsed Time	36 Days	27 Days	Requested	36 Days	36 Days	36 Days	27 Days	32 Days	32 Days	Requested
Cadmium (SW7131)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	24 Oct 88	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88	24 Oct 88	24 Oct 88	20 Oct 88	26 Oct 88	Analysis Not
Elapsed Time	41 Days	42 Days	Requested	40 Days	40 Days	41 Days	42 Days	39 Days	39 Days	Requested
Chromium (SW7191)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	7 Nov 88	2 Nov 88	Analysis Not	1 Nov 88	1 Nov 88	7 Nov 88	2 Nov 88	16 Oct 88	16 Oct 88	Analysis Not
Elapsed Time	55 Days	51 Days	Requested	48 Days	48 Days	55 Days	51 Days	35 Days	35 Days	Requested
Lead (SW7421)			ANALYZE WITHIN 180 DAYS OF COLLECTION							
Date Analyzed	25 Oct 88	26 Oct 88	Analysis Not	26 Oct 88	26 Oct 88	25 Oct 88	26 Oct 88	16 Oct 88	16 Oct 88	Analysis Not
Elapsed Time	42 Days	44 Days	Requested	42 Days	42 Days	42 Days	44 Days	35 Days	35 Days	Requested

TABLE N-16
(Continued)

	GW4-D 9-13-88 DANGB-4-GW4D-GW-1 88092389	MW21 9-10-88 DANGB-4-MW21-GW-1 88092321	MW22 9-10-88 DANGB-4-MW22-GW-1 88092325	MW22 FB 9-10-88 DANGB-FB6	MW23 9-10-88 DANGB-4-MW23-GW-1 88092312	MW24 9-10-88 DANGB-4-MW24-GW-1 88092322	TB1 9-12-88 DANGB-TB4 88092351	TB2 9-13-88 DANGB-TB6 88092391	BR1 9-12-88 DANGB-BR4 88092350	BR2 9-12-88 DANGB-BR5 88092354
Date Collected	13 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	10 Sep 88	12 Sep 88	13 Sep 88	12 Sep 88	12 Sep 88
Barium (SW6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	19 Oct 88	18 Oct 88	18 Oct 88	Analysis Not Requested	17 Oct 88	18 Oct 88	Analysis Not Requested	Analysis Not Requested	9 Oct 88	19 Oct 88
Elapsed Time	36 Days	38 Days	38 Days		37 Days	38 Days			27 Days	37 Days
Cadmium (SW7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	24 Oct 88	24 Oct 88	24 Oct 88	Analysis Not Requested	24 Oct 88	24 Oct 88	Analysis Not Requested	Analysis Not Requested	24 Oct 88	24 Oct 88
Elapsed Time	41 Days	44 Days	44 Days		44 Days	44 Days			42 Days	42 Days
Chromium (SW7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	[illegible] Nov 88	1 Nov 88	1 Nov 88	Analysis Not Requested	28 Oct 88	1 Nov 88	Analysis Not Requested	Analysis Not Requested	2 Nov 88	2 Nov 88
Elapsed Time	55 Days	52 Days	52 Days		48 Days	52 Days			51 Days	51 Days
Lead (SW7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	25 Oct 88	22 Oct 88	22 Oct 88	Analysis Not Requested	20 Oct 88	22 Oct 88	Analysis Not Requested	Analysis Not Requested	26 Oct 88	25 Oct 88
Elapsed Time	12 Days	40 Days	40 Days		40 Days	40 Days			44 Days	43 Days

TABLE N-17
Site 8
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Surface Water Samples

	SL17 9-24-88 DANGB 8-SL17-SW-1 88092721	SL19 9-24-88 DANGB-8-SL19-SW-1 88092726	SL19 FB 9-24-88 DANGB-FB18 88092729	SL19 DUP 9-24 88 DANGB-8-SL27-SW-1 88092727	TB1 9-24-88 DANGB-TB13 88092730
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	30 Sep 88	30 Sep 88	1 Oct 88	30 Sep 88	1 Oct 88
Elapsed Time	6 Days	6 Days	7 Days	6 Days	7 Days
2nd Column	29 Sep 88	29 Sep 88	4 Oct 88	29 Sep 88	7 Oct 88
Elapsed Time	5 Days	5 Days	10 Days	5 Days	13 Days
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	30 Sep 88	30 Sep 88	1 Oct 88	30 Sep 88	1 Oct 88
Elapsed Time	6 Days	6 Days	7 Days	6 Days	7 Days
2nd Column	29 Sep 88	---------	---------	29 Sep 88	---------
Elapsed Time	5 Days	---------	---------	5 Days	---------
PESTICIDES AND PCB's (EPA 608)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	29 Sep 88	30 Sep 88	Analysis Not	30 Sep 88	Analysis Not
Elapsed Time	5 Days	6 Days	Requested	6 Days	Requested
Date Analyzed	24 Oct 88	24 Oct 88	Analysis Not	24 Oct 88	Analysis Not
Elapsed Time	30 Days	30 Days	Requested	30 Days	Requested
2rd Column	26 Oct 88	26 Oct 88	Analysis Not	---------	Analysis Not
Elapsed Time	32 Days	32 Days	Requested	---------	Requested
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	10 Oct 88	10 Oct 88	Analysis Not	10 Oct 88	Analysis Not
Elapsed Time	16 Days	16 Days	Requested	16 Days	Requested
Date Analyzed	12 Oct 88	12 Oct 88	Analysis Not	12 Oct 88	Analysis Not
Elapsed Time	18 Days	18 Days	Requested	18 Days	Requested

TABLE N-17
(Continued)

	SL17 9-24-88 DANGB-8 SL17-SW-1 88092721	SL19 9-24-88 DANGB-8-SL19-SW-1 88092726	SL19 FB 9-24 88 DANGB-FBI8 88092729	SL19 DUP 9-24-88 DANGB-8-SL27-SW-1 88092727	TB1 9-24-88 DANGB-TB13 88092730
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88
Barium (SW 6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	21 Oct 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	27 Days				
Cadmium (SW 7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	27 Oct 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	33 Days				
Chromium (SW 7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	21 Oct 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	27 Days				
Lead (SW 7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION				
Date Analyzed	22 Oct 88	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Elapsed Time	28 Days				

TABLE N-18
Site 8
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Sediment Samples

	SL17 9-24-88 DANGB 8-SL17-SD-1 88092735	SL18-8 9-24-88 DANGB-8-SL18-SD-1 88092736	SL19-8 9-24-88 DANGB-8-SL19-SD-1 88092737	SL19-8 DUP 9-24-88 DANGB-8-SL27-SD-1 88092734
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	5 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	11 Days	12 Days	12 Days	12 Days
2nd Column	4 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION			
Date Analyzed	5 Oct 88	6 Oct 88	6 Oct 88	6 Oct 88
Elapsed Time	11 Days	12 Days	12 Days	12 Days
2nd Column	4 Oct 88	4 Oct 88	4 Oct 88	4 Oct 88
Elapsed Time	10 Days	10 Days	10 Days	10 Days
PESTICIDES AND PCB's (SW 8080)	NO HOLDING TIME SPECIFIED			
Date Extracted	7 Oct 88	7 Oct 88	6 Oct 88	7 Oct 88
Elapsed Time	13 Days	13 Days	13 Days	13 Days
Date Analyzed	25 Oct 88	25 Oct 88	6 Oct 88	25 Oct 88
Elapsed Time	31 Days	31 Days	31 Days	31 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED			
Date Extracted	13 Oct 88	13 Oct 88	13 Oct 88	13 Oct 88
Elapsed Time	29 Days	29 Days	29 Days	29 Days
Date Analyzed	22 Oct 88	22 Oct 88	22 Oct 88	22 Oct 88
Elapsed Time	28 Days	28 Days	28 Days	28 Days

TABLE N-18
(Continued)

	SL17 9-24 88 DANGB 8-SL17-SD-1 88092735	SL18-8 9-24-88 DANGB-8-SL18-SD-1 88092736	SL19-8 9-24-88 DANGB-8-SL19-SD-1 88092737	SL19-8 DUP 9-24-88 DANGB-8-SL27-SD-1 88092734
Date Collected	24 Sep 88	24 Sep 88	24 Sep 88	24 Sep 88
Barium (SW 6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	17 Oct 88	17 Oct 88	17 Oct 88	17 Oct 88
Elapsed Time	23 Days	23 Days	23 Days	23 Days
Cadmium (SW 7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	19 Oct 88	19 Oct 88	19 Oct 88	18 Oct 88
Elapsed Time	25 Days	25 Days	25 Days	24 Days
Chromium (SW 7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	18 Oct 88	18 Oct 88	19 Oct 88	18 Oct 88
Elapsed Time	24 Days	24 Days	25 Days	24 Days
Lead (SW 7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	18 Oct 88	25 Oct 88	20 Oct 88	18 Oct 88
Elapsed Time	24 Days	31 Days	26 Days	24 Days
PERCENT MOISTURE				
Date Analyzed	10 Oct 88	10 Oct 88	10 Oct 88	10 Oct 88
Elapsed Time	16 Days	16 Days	16 Days	16 Days

TABLE N-19
Site 8
Minnesota Air National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Soil Samples

	MW14-SS1 0-1 8-8-88 DANGB 8-MW14-SS1 88081706	MW14-SS3 10-12 8-8-88 DANGB-8-MW14-SS3 88081707	MW14-SS3 DUP 10-12 8-8-88 DANGB-8-MW14-SS9 88081709	MW14-R SS3 10-12 8-31-88 DANGB-8-MW14-SS3 88092250	MW14 R-SS3 DUP 10-12 8-31-88 DANGB-8-MW14-SS9 88092251	MW14-SS8 38-40 8-8-88 DANGB 8-MW14-SS8 88081708	MW16-SS1 0-1 8-10-88 DANGB-8-MW16-SS1 88081752	MW16-SS2 4-5 8-10-88 DANGB-8-MW16-SS2 88081753	MW16-SS6 29-30 8-10-88 DANGB-8-MW16-SS6 88081754	MW18A-SS1 0-2 8-5-88 DANGB-8-MW18-SS1 88081695
Date Collected	8 Aug 88	8 Aug 88	8 Aug 88	31 Aug 88	31 Aug 88	8 Aug 88	10 Aug 88	10 Aug 88	10 Aug 88	5 Aug 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	18 Aug 88	17 Aug 88	17 Aug 88	13 Sep 88	13 Sep 88	17 Aug 88	20 Aug 88	21 Aug 88	21 Aug 88	16 Aug 88
Elapsed Time	10 Days	9 Days	9 Days	13 Days	13 Days	9 Days	10 Days	11 Days	11 Days	11 Days
2nd Column	18 Aug 88	18 Aug 88	18 Aug 88	12 Sep 88	12 Sep 88	18 Aug 88	22 Aug 88	22 Aug 88	21 Aug 88	16 Aug 88
Elapsed Time	10 Days	10 Days	10 Days	12 Days	12 Days	10 Days	12 Days	12 Days	11 Days	11 Days
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	18 Aug 88	17 Aug 88	17 Aug 88	13 Sep 88	13 Sep 88	17 Aug 88	20 Aug 88	21 Aug 88	21 Aug 88	16 Aug 88
Elapsed Time	10 Days	9 Days	9 Days	13 Days	13 Days	9 Days	10 Days	11 Days	11 Days	11 Days
2nd Column	21 Aug 88	18 Aug 88	17 Aug 88	11 Sep 88	11 Sep 88	18 Aug 88	22 Aug 88	22 Aug 88	21 Aug 88	16 Aug 88
Elapsed Time	13 Days	10 Days	9 Days	11 Days	11 Days	10 Days	12 Days	12 Days	11 Days	11 Days
PESTICIDES AND PCB's (SW 8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	Not	16 Sep 88	16 Sep 88	7 Sep 88	7 Sep 88	16 Sep 88	8 Sep 88	8 Sep 88	8 Sep 88	Not
Elapsed Time	Given	39 Days	39 Days	7 Days	7 Days	39 Days	29 Days	29 Days	29 Days	Given
Date Analyzed	18 Sep 88	18 Sep 88	18 Sep 88	5 Oct 88	5 Oct 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88
Elapsed Time	41 Days	41 Days	41 Days	35 Days	35 Days	41 Days	39 Days	39 Days	39 Days	44 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED									
Date Extracted	29 Aug 88	Not	Not	22 Sep 88	22 Sep 88	29 Aug 88	9 Sep 88	9 Sep 88	9 Sep 88	29 Aug 88
Elapsed Time	21 Days	Given	Given	22 Days	22 Days	21 Days	30 Days	30 Days	30 Days	24 Days
Date Analyzed	31 Aug 88	Not	31 Aug 88	23 Sep 88	23 Sep 88	31 Aug 88	11 Sep 88	11 Sep 88	11 Sep 88	31 Aug 88
Elapsed Time	23 Days	Given	23 Days	23 Days	23 Days	23 Days	32 Days	32 Days	32 Days	26 Days

TABLE N-19
(Continued)

	MW18A-SS2 8-11 8-5-88 DANGB-8-MW18-SS2 88081696	MW18A-SS3 14-15 8-5-88 DANGB-8-MW18-SS3 88081697	MW19A-SS1 0-2 8-10-88 DANGB-8-MW19-SS1 88081749	MW19A-SS2 6.5-7.5 8-10-88 DANGB-8-MW19-SS2 88081750	MW19A-SS3 9-10 8-10-88 DANGB-8-MW19-SS3 88081751	MW20A-SS1 0-2 8-5-88 DANGB-8-MW20-SS1 88081698	MW20A R-SS1 0-2 8-31-88 DANGB-8-MW20-SS1 88092253	MW20A R-SS1 DUP 0-2 8-31-88 DANGB-8-MW20-SS5 88092252	MW20A-SS2 6-8 8-5-88 DANGB-8-MW20-SS2 88081699	MW20A-SS4 15-20.5 8-5-88 DANGB-8-MW20-SS4 88081700
Date Collected	5 Aug 88	5 Aug 88	10 Aug 88	10 Aug 88	10 Aug 88	5 Aug 88	31 Aug 88	31 Aug 88	5 Aug 88	5 Aug 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	16 Aug 88	17 Aug 88	20 Aug 88	29 Aug 88	20 Aug 88	16 Aug 88	13 Sep 88	13 Sep 88	18 Aug 88	17 Aug 88
Elapsed Time	11 Days	12 Days	10 Days	10 Days	10 Days	11 Days	13 Days	13 Days	13 Days	12 Days
2nd Column	17 Aug 88	17 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	17 Aug 88	12 Sep 88	12 Sep 88	17 Aug 88	17 Aug 88
Elapsed Time	12 Days	12 Days	10 Days	10 Days	10 Days	12 Days	12 Days	12 Days	12 Days	12 Days
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed	16 Aug 88	17 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	16 Aug 88	.3 Sep 88	13 Sep 88	17 Aug 88	17 Aug 88
Elapsed Time	11 Days	12 Days	10 Days	10 Days	10 Days	11 Days	13 Days	13 Days	12 Days	12 Days
2nd Column	17 Aug 88	17 Aug 88	20 Aug 88	20 Aug 88	20 Aug 88	17 Aug 88	11 Sep 88	11 Sep 88	17 Aug 88	17 Aug 88
Elapsed Time	12 Days	12 Days	10 Days	10 Days	10 Days	12 Days	11 Days	11 Days	12 Days	12 Days
PESTICIDES AND PCB's (SW 8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted	Not	Not	8 Sep 88	8 Sep 88	8 Sep 88	Not	7 Sep 88	7 Sep 88	Not	Not
Elapsed Time	Given	Given	29 Days	29 Days	29 Days	Given	7 Days	7 Days	Given	Given
Date Analyzed	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	18 Sep 88	5 Oct 88	5 Oct 88	18 Sep 88	18 Sep 88
Elapsed Time	44 Days	44 Days	39 Days	39 Days	39 Days	44 Days	35 Days	35 Days	44 Days	44 Days
2nd Column	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
Elapsed Time	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED									
Date Extracted	29 Aug 88	29 Aug 88	9 Sep 88	9 Sep 88	9 Sep 88	Analysis	22 Sep 88	22 Sep 88	29 Aug 88	29 Aug 88
Elapsed Time	24 Days	24 Days	30 Days	30 Days	30 Days	Missing	22 Days	22 Days	24 Days	24 Days
Date Analyzed	31 Aug 88	31 Aug 88	11 Sep 88	11 Sep 88	11 Sep 88	Analysis	23 Sep 88	23 Sep 88	31 Aug 88	31 Aug 88
Elapsed Time	26 Days	26 Days	32 Days	32 Days	32 Days	Missing	23 Days	23 Days	26 Days	26 Days

TABLE N-19
(Continued)

	SSA0 0-2 7-12-88 DANGB-8-SS-A0 88071404	SSA0 DUP 0-2 7-12-88 DANGB-8-SS-G0 88071374	SSA1 0-2 7-12-88 DANGB-8-SS-A1 88071399	SSA2 0-2 7-11-88 DANGB-8-SS-A2 88071387	SSA3 0-2 7-11-88 DANGB-8-SS-A3 88071384	SSB0 0-2 7-12-88 DANGB-8-SS-B0 88071397	SSB1 0-2 7-12-88 DANGB-8-SS-B1 88071403	SSB2 0-2 7-11-88 DANGB-8-SS-B2 88071385	SSB3 0-2 7-10-88 DANGB-8-SS-B3 88071381	SSC0 0-2 7-12-88 DANGB-8-SS-C0 88071395
Date Collected	12 July 88	12 July 88	12 July 88	11 July 88	11 July 88	12 July 88	12 July 88	11 July 88	10 July 88	12 July 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PESTICIDES AND PCB's (SW 8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted Elapsed Time	15 July 88 3 Days	15 July 88 3 Days	15 July 88 3 Days	14 July 88 3 Days	14 July 88 3 Days	15 July 88 3 Days	15 July 88 3 Days	14 July 88 3 Days	14 July 88 4 Days	15 July 88 3 Days
Date Analyzed Elapsed Time	30 July 88 18 Days	29 July 88 17 Days	30 July 88 18 Days	29 July 88 18 Days	29 July 88 18 Days	30 July 88 18 Days	30 July 88 18 Days	29 July 88 18 Days	29 July 88 19 Days	30 July 88 18 Days
2nd Column Elapsed Time	11 Aug 88 30 Days	11 Aug 88 30 Days	11 Aug 88 30 Days	11 Aug 88 31 Days	11 Aug 88 31 Days	11 Aug 88 30 Days	11 Aug 88 30 Days	11 Aug 88 31 Days	-------- --------	-------- --------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED									
Date Extracted Elapsed Time	18 July 88 6 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 8 Days	18 July 88 6 Days
Date Analyzed Elapsed Time	20 July 88 8 Days	19 July 88 7 Days	20 July 88 8 Days	19 July 88 8 Days	19 July 88 8 Days	20 July 88 8 Days	20 July 88 8 Days	19 July 88 8 Days	19 July 88 9 Days	20 July 88 8 Days

TABLE N-19
(Continued)

	SSC1 0-2 7-12-88 DANGB-8-SS C1 88071396	SSC2 0-2 7-11-88 DANGB-8-SS-C2 88071390	SSC3 0-2 7-11-88 DANGB-8-SS-C3 88071389	SSD0 0 2 7-12 88 DANGB 8 SS-D0 88071405	SSD1 0-2 7-12-88 DANGB-8-SS-D1 88071391	SSD2 0-2 7-11-88 DANGB-8-SS-D2 88071382	SSD2 DUP 0-2 7-11-88 DANGB-8-SS-G2 88071388	SSD3 0-2 7-11-88 DANGB-8-SS-D3 88071383	SSE0 0-2 7-12-88 DANGB-8-SS-E0 88071406	SSE1 0-2 7-12-88 DANGB-8-SS-E1 88071409
Date Collected	12 July 88	11 July 88	11 July 88	12 July 88	12 July 88	11 July 88	11 July 88	11 July 88	12 July 88	12 July 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION									
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PESTICIDES AND PCB's (SW 8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION									
Date Extracted Elapsed Time	15 July 88 3 Days	14 July 88 3 Days	14 July 88 3 Days	15 July 88 3 Days	15 July 88 3 Days	14 July 88 3 Days	14 July 88 3 Days	14 July 88 3 Days	15 July 88 3 Days	15 July 88 3 Days
Date Analyzed Elapsed Time	30 July 88 18 Days	29 July 88 18 Days	19 July 88 8 Days	30 July 88 18 Days	29 July 88 17 Days	29 July 88 18 Days	29 July 88 18 Days	29 July 88 18 Days	30 July 88 18 Days	30 July 88 18 Days
2nd Column Elapsed Time	17 Aug 88 36 Days	17 Aug 88 37 Days	-------- --------	-------- --------	11 Aug 88 30 Days	-------- --------	-------- --------	-------- --------	-------- --------	-------- --------
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED									
Date Extracted Elapsed Time	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days
Date Analyzed Elapsed Time	20 July 88 8 Days	19 July 88 8 Days	19 July 88 8 Days	20 July 88 8 Days	19 July 88 7 Days	19 July 88 8 Days	19 July 88 8 Days	19 July 88 8 Days	20 July 88 8 Days	20 July 88 8 Days

TABLE N-19
(Continued)

	SSE2 0-2 7-12 88 DANGB 8-SS-E2 88071393	SSE3 0-2 7-11-88 DANGB-8-SS-E3 88071386	SSF0 0-2 7-12-88 DANGB-8-SS-F0 88071401	SSF1 0-2 7-12-88 DANGB 8-SS-F1 88071398	SSF1 DUP 0-2 7-12-88 DANGB-8-SS-G1 88071392	SSF2 0-2 7-12-88 DANGB-8-SS-F2 88071402	SSF3 0-2 7-11-88 DANGB-8-SS-F3 88071380
Date Collected	12 July 88	11 July 88	12 July 88	12 July 88	12 July 88	12 July 88	11 July 88
HALOGENATED VOLATILE ORGANICS (SW 8010)	ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
AROMATIC VOLATILE ORGANICS (SW 8020)	ANALYZE WITHIN 14 DAYS OF COLLECTION						
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
2nd Column Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PESTICIDES AND PCB's (SW 8080)	EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION						
Date Extracted	15 July 88	14 July 88	15 July 88	15 July 88	15 July 88	15 July 88	14 July 88
Elapsed Time	3 Days	3 Days	3 Days	3 Days	3 Days	3 Days	3 Days
Date Analyzed	29 July 88	29 July 88	30 July 88	30 July 88	29 July 88	30 July 88	29 July 88
Elapsed Time	17 Days	18 Days	18 Days	18 Days	17 Days	18 Days	18 Days
2nd Column	---------	---------	---------	11 Aug 88	11 Aug 88	---------	11 Aug 88
Elapsed Time	------- -	---------	---------	30 Days	30 Days	---------	31 Days
TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)	NO HOLDING TIME SPECIFIED						
Date Extracted	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88
Elapsed Time	6 Days	7 Days	6 Days	6 Days	6 Days	6 Days	7 Days
Date Analyzed	19 July 88	19 July 88	20 July 88	20 July 88	19 July 88	20 July 88	19 July 88
Elapsed Time	7 Days	8 Days	8 Days	8 Days	7 Days	8 Days	8 Days

TABLE N-19
(Continued)

	MW14-SS1 0-1 8-8-88 DANGB-8-MW14-SS1 88081706	MW14-SS3 10-12 8-8-88 DANGB-8-MW14-SS3 88081707	MW14-SS3 DUP 10-12 8-8-88 DANGB-8-MW14-SS9 88081709	MW14-R SS3 10-12 8-31-88 DANGB-8-MW14-SS3 88092250	MW14 R-SS3 DUP 10-12 8-31-88 DANGB-8-MW14-SS9 88092251	MW14-SS8 38-40 8-8-88 DANGB-8-MW14-SS8 88081708	MW16-SS1 0-1 8-10 88 DANGB-8-MW16-SS1 88081752	MW16-SS2 4-5 8-10-88 DANGB-8-MW16 SS2 88081753	MW16-SS6 29-30 8-10-88 DANGB-8-MW16-SS6 88081754	MW18A-SS1 0-2 8-5-88 DANGB-8-MW18-SS1 88081695
Date Collected	8 Aug 88	8 Aug 88	8 Aug 88	31 Aug 88	31 Aug 88	8 Aug 88	10 Aug 88	10 Aug 88	10 Aug 88	5 Aug 88
Barium (SW 6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	Not	7 Sep 88	17 Oct 88	17 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88
Elapsed Time	30 Days	Given	30 Days	47 Days	47 Days	30 Days	28 Days	28 Days	28 Days	33 Days
Cadmium (SW 7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	Not	7 Sep 88	17 Oct 88	17 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88
Elapsed Time	30 Days	Given	30 Days	47 Days	47 Days	30 Days	28 Days	28 Days	28 Days	33 Days
Chromium (SW 7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	Not	7 Sep 88	17 Oct 88	17 Oct 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88
Elapsed Time	30 Days	Given	30 Days	47 Days	47 Days	30 Days	28 Days	28 Days	28 Days	33 Days
Lead (SW 7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	16 Sep 88	Not	16 Sep 88	17 Oct 88	17 Oct 88	16 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	13 Sep 88
Elapsed Time	39 Days	Given	39 Days	47 Days	47 Days	39 Days	37 Days	37 Days	37 Days	39 Days
PERCENT MOISTURE										
Date Analyzed	12 Aug 88	Not	12 Aug 88	9 Sep 88	9 Sep 88	12 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	15 Aug 88
Elapsed Time	4 Days	Given	4 Days	9 Days	9 Days	4 Days	7 Days	7 Days	7 Days	10 Days
SEMI-VOLATILE ORGANICS (SW 8270)		NO HOLDING TIME SPECIFIED								
Date Extracted	Analysis	Analysis	Not	10 Sep 88	10 Sep 88	Analysis	Analysis	Analysis	Analysis	Not
Elapsed Time	cancelled	cancelled	Given	10 Days	10 Days	cancelled	cancelled	cancelled	cancelled	Given
Date Analyzed	Analysis	Analysis	Not	21 Oct 88	21 Oct 88	Analysis	Analysis	Analysis	Analysis	Not
Elapsed Time	cancelled	cancelled	Given	51 Days	51 Days	cancelled	cancelled	cancelled	cancelled	Given

TABLE N-19
(Continued)

	MW18A-SS2 8-11 8-5-88 DANGB-8-MW18-SS2 88081696	MW18A-SS3 14-15 8-5-88 DANGB-8-MW18-SS3 88081697	MW19A-SS1 0-2 8-10-88 DANGB-8-MW19-SS1 88081749	MW19A-SS2 6.5-7.5 8-10 83 DANGB-8-MW19-SS2 88081750	MW19A-SS3 9-10 8-10-88 DANGB-8-MW19-SS3 88081751	MW20A-SS1 0-2 8-5-88 DANGB-8-MW20-SS1 88081698	MW20A R-SS1 0-2 8-31-88 DANGB-8-MW20-SS1 88092253	MW20A R-SS1 DUP 0-2 8-31-88 DANGB-8-MW20-SS5 88092252	MW20A-SS2 6-8 8-5-88 DANGB-8-MW20-SS2 88081699	MW20A-SS4 15-20.5 8-5-88 DANGB-8-MW20-SS4 88081700
Date Collected	5 Aug 88	5 Aug 88	10 Aug 88	10 Aug 88	10 Aug 88	5 Aug 88	31 Aug 88	31 Aug 88	5 Aug 88	5 Aug 88
Barium (SW 6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	Not	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88
Elapsed Time	33 Days	33 Days	28 Days	28 Days	28 Days	Given	50 Days	50 Days	33 Days	33 Days
Cadmium (SW 7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	Not	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88
Elapsed Time	33 Days	33 Days	28 Days	28 Days	28 Days	Given	50 Days	50 Days	33 Days	33 Days
Chromium (SW 7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	7 Sep 83	7 Sep 88	7 Sep 88	7 Sep 88	7 Sep 88	Not	20 Oct 88	20 Oct 88	7 Sep 88	7 Sep 88
Elapsed Time	33 Days	33 Days	28 Days	28 Days	28 Days	Given	50 Days	50 Days	33 Days	33 Days
Lead (SW 7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed	13 Sep 88	13 Sep 88	16 Sep 88	16 Sep 88	16 Sep 88	Not	20 Oct 88	20 Oct 88	13 Sep 88	13 Sep 88
Elapsed Time	39 Days	39 Days	37 Days	37 Days	37 Days	Given	50 Days	50 Days	39 Days	39 Days
PERCENT MOISTURE										
Date Analyzed	15 Aug 88	15 Aug 88	17 Aug 88	17 Aug 88	17 Aug 88	Not	9 Sep 88	9 Sep 38	15 Aug 88	15 Aug 88
Elapsed Time	10 Days	10 Days	7 Days	7 Days	7 Days	Given	9 Days	9 Days	10 Days	10 Days
SEMI-VOLATILE ORGANICS (SW 8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted	Not	Not	Analysis	Analysis	Analysis	Analysis	Not	10 Sep 88	Not	Not
Elapsed Time	Given	Given	cancelled	cancelled	cancelled	cancelled	Given	10 Days	Given	Given
Date Analyzed	Not	Not	Analysis	Analysis	Analysis	Analysis	Not	21 Sep 88	Not	Not
Elapsed Time	Given	Given	cancelled	cancelled	cancelled	cancelled	Given	21 Days	Given	Given

TABLE N-19
(Continued)

	SSA0 0-2 7-12-88 DANGB-8-SS-A0 88071404	SSA0 DUP 0-2 7-12-88 DANGB-8-SS-G0 88071394	SSA1 0-2 7-12-88 DANGB-8-SS-A1 880713999	SSA2 0-2 7-11-88 DANGB-8-SS-A2 88071387	SSA3 0-2 7-11-88 DANGB-8-SS-A3 88071384	SSB0 0-2 7-12-88 DANGB-8-SS-B0 88071397	SSB1 0-2 7-12-88 DANGB 8-SS-B1 88071403	SSB2 0-2 7-11-88 DANGB-8-SS-B2 88071385	SSB3 0-2 7-10-88 DANGB-8-SS-B3 88071381	SSC0 0-2 7-12-88 DANGB-8-SS-C0 88071395
Date Collected	12 July 88	12 July 88	12 July 88	11 July 88	11 July 88	12 July 88	12 July 88	11 July 88	10 July 88	12 July 88
Barium (SW 6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Cadmium (SW 7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Chromium (SW 7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Lead (SW 7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE										
Date Analyzed Elapsed Time	13 July 88 6 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 8 Days	18 July 88 6 Days
SEMI-VOLATILE ORGANICS (SW 8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested

TABLE N-19
(Continued)

	SSC1 0-2 7-12-88 DANGB-8-SS-C1 88071396	SSC2 0-2 7-11-88 DANGB-8-SS-C2 88071390	SSC3 0-2 7-11-88 DANGB-8-SS-C3 880713[illegible]	SSD0 0-2 7-12-88 DANGB-8-SS-D0 88071405	SSD1 0-2 7-12-88 DANGB-8-SS-D1 88071391	SSD2 0-2 7-11-88 DANGB-8-SS-D2 88071382	SSD2 DUP 0-2 7-11-88 DANGB-8-SS-G2 88071388	SSD3 0-2 7-11-88 DANGB-8-SS-D3 88071383	SSE0 0-2 7-12-88 DANGB-8-SS-E0 88071406	SSE1 0-2 7-12-88 DANGB-8-SS-E1 88071400
Date Collected	12 July 88	11 July 88	11 July 88	12 July 88	12 July 88	11 July 88	11 July 88	11 July 88	12 July 88	12 July 88
Barium (SW 6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Cadmium (SW 7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Chromium (SW 7191)		ANALYZE WITHIN 28 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Lead (SW 7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION								
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE										
Date Analyzed Elapsed Time	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 7 Days	18 July 88 6 Days	18 July 88 6 Days
SEMI-VOLATILE ORGANICS (SW 8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION								
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested

TABLE N-19
(Continued)

	SSF2 0-2 7-12-88 DANGB-8-SS-E2 88071393	SSE3 0-2 7-11-88 DANGB-8-SS-E3 88071386	SSF0 0-2 7-12-88 DANGB-8-SS-F0 88071401	SSF1 0-2 7-12-88 DANGB-8-SS-F1 88071398	SSF1 DUP 0-2 7-12-88 DANGB-8-SS-G1 88071392	SSF2 0-2 7-12-88 DANGB-8-SS-F2 88071402	SSF3 0-2 7-11-88 DANGB-8-SS-F3 88071380
Date Collected	12 July 88	11 July 88	12 July 88	12 July 88	12 July 88	12 July 88	11 July 88
Barium (SW 6010)		ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Cadmium (SW 7131)		ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Chromium (SW 7191)		ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Lead (SW 7421)		ANALYZE WITHIN 180 DAYS OF COLLECTION					
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
PERCENT MOISTURE							
Date Analyzed	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88	18 July 88
Elapsed Time	6 Days	7 Days	6 Days	6 Days	6 Days	6 Days	7 Days
SEMI-VOLATILE ORGANICS (SW 8270)		EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION					
Date Extracted Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested
Date Analyzed Elapsed Time	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested	Analysis Not Requested

TABLE N-20
Site 8
Minnesota ir National Guard Base
Duluth, Minnesota
Summary of Holding Time Data for Ground-Water Samples

	MW14 9-8-88 DANGB-8-MW14-GW-1 88092303	MW14 DUP 9-8-88 DANGB-8-MW51-GW-1 88092304	MW14 FB 9-8-88 DANGB-FB3 88092309	MW15 9-9-88 DANGB 8-MW15-GW-1 88092317	MW15 FB 9-9-8[illegible] DANGB-FB4 88[illegible]	MW16 9-9-88 [illegible]B-8-MW16-GW-1 88092315	MW17 9-9-88 DANGB-8-MW17 GW-1 88092314	MW17 FB 9-9-88 DANGB-FB5 88092332	GW 8-A 9-10-88 DANGB-8-GW8A-GW-1 88092327	GW 8-B 9-10-88 DANGB-8-GW8B-GW-1 88092323
Date Collected	8 Sep 88	8 Sep 88	8 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	10 Sep 88	10 Sep 88
HALOGENATED VOLATILE ORGANICS (ANALYZE WITHIN 14 DAYS OF COLLECTION										
Date Analyzed	16 Sep 88	15 Sep 88	15 Sep 88	16 Sep 88	15 Sep 88	16 Sep 88	16 Sep 88	15 Sep 88	20 Sep 88	20 Sep 88
Elapsed Time	8 Days	7 Days	7 Days	7 Days	6 Days	7 Days	7 Days	6 Days	10 Days	10 Days
2nd Column	14 Sep 88	14 Sep 88	16 Sep 88	15 Sep 88	19 Sep 88	15 Sep 88	15 Sep 88	19 Sep 88	15 Sep 88	15 Sep 88
Elapsed Time	6 Days	6 Days	8 Days	6 Days	10 Days	6 Days	6 Days	10 Days	5 Days	5 Days
AROMATIC VOLATILE ORGANICS (SW 8 ANALYZE WITHIN 14 DAYS OF COLLECTION										
Date Analyzed	16 Sep 88	15 Sep 88	15 Sep 88	16 Sep 88	15 Sep 88	16 Sep 88	16 Sep 88	15 Sep 88	20 Sep 88	20 Sep 88
Elapsed Time	8 Days	7 Days	7 Days	7 Days	6 Days	7 Days	7 Days	6 Days	10 Days	10 Days
2nd Column	--------	--------	--------	--------	1[illegible] Sep 88	--------	--------	--------	--------	15 Sep 88
Elapsed Time	--------	--------	--------	--------	10 Days	--------	--------	--------	--------	5 Days
PESTICIDES AND PCB's (EPA 608) EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION										
Date Extracted	14 Sep 88	14 Sep 88	Analysis Not	15 Sep 88	Analysis Not	15 Sep 88	15 Sep 88	Analysis Not	15 Sep 88	15 Sep 88
Elapsed Time	6 Days	6 Days	Requested	6 Days	Requested	6 Days	6 Days	Requested	5 Days	5 Days
Date Analyzed	6 Oct 88	6 Oct 88	Analysis Not	16 Oct 88	Analysis Not	16 Oct 88	16 Oct 88	Analysis Not	16 Oct 88	16 Oct 88
Elapsed Time	18 Days	18 Days	Requested	37 Days	Requested	37 Days	37 Days	Requested	36 Days	36 Days
2nd Column	--------	--------	Analysis Not	19 Oct 88	Analysis Not	19 Oct 88	19 Oct 88	Analysis Not	19 Oct 88	--------
Elapsed Time	--------	--------	Requested	40 Days	Requested	40 Days	40 Days	Requested	39 Days	--------
TOTAL PETROLEUM HYDROCARBONS (EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION										
Date Extracted	28 Sep 88	28 Sep 88	Analysis Not	28 Sep 88	Analysis Not	28 Sep 88	28 Sep 88	Analysis Not	29 Sep 88	29 Sep 88
Elapsed Time	20 Days	20 Days	Requested	19 Days	Requested	19 Days	19 Days	Requested	19 Days	19 Days
Date Analyzed	5 Oct 88	5 Oct 88	Analysis Not	5 Oct 88	Analysis Not	5 Oct 88	5 Oct 88	Analysis Not	5 Oct 88	5 Oct 88
Elapsed Time	17 Days	17 Days	Requested	26 Days	Requested	26 Days	26 Days	Requested	25 Days	25 Days

TABLE N-20
(Continued)

	GW 8-C 9-9-88 DANGB-GW8C-GW-1 88092313/88092620	TB1 9-9-88 DANGB-TB2 88092330	BR1 9-10-88 DANGB-BR3 88092324	BR2 9-9 88 DANGB-BR2 88092316
Date Collected	9 Sep 88	9 Sep 88	10 Sep 88	9 Sep 88
HALOGENATED VOLATILE ORGANICS (ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	16 Sep 88	14 Sep 88	14 Sep 88	16 Sep 88
Elapsed Time	7 Days	5 Days	4 Days	7 Days
2nd Column	14 Sep 88	16 Sep 88	16 Sep 88	15 Sep 88
Elapsed Time	5 Days	7 Days	6 Days	6 Days
AROMATIC VOLATILE ORGANICS (SW 8 ANALYZE WITHIN 14 DAYS OF COLLECTION				
Date Analyzed	16 Sep 88	14 Sep 88	14 Sep 88	16 Sep 88
Elapsed Time	7 Days	5 Days	4 Days	7 Days
2nd Column	--------	16 Sep 88	16 Sep 88	--------
Elapsed Time	--------	7 Days	6 Days	--------
PESTICIDES AND PCB's (EPA 608) EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	15 Sep 88	Analysis Not	15 Sep 88	15 Sep 88
Elapsed Time	6 Days	Requested	5 Days	6 Days
Date Analyzed	16 Oct 88	Analysis Not	16 Sep 88	16 Oct 88
Elapsed Time	37 Days	Requested	6 Days	37 Days
2nd Column	19 Oct 88	Analysis Not	19 Oct 88	19 Oct 88
Elapsed Time	40 Days	Requested	39 Days	40 Days
TOTAL PETROLEUM HYDROCARBONS (EXTRACT WITHIN 14 DAYS OF COLLECTION AND ANALYZE WITHIN 40 DAYS OF EXTRACTION				
Date Extracted	1 Oct 88	Analysis Not	29 Sep 88	28 Sep 88
Elapsed Time	23 Days	Requested	19 Days	19 Days
Date Analyzed	10 Oct 88	Analysis Not	5 Oct 88	5 Oct 88
Elapsed Time	32 Days	Requested	25 Days	26 Days

TABLE N-20
(Continued)

	MW14 9-8-88 DANGB-8-MW14-GW-1 88092303	MW14 DUP 9-8-88 DANGB-8-MW51-GW-1 88092304	MW14 FB 9-8-88 DANGB-FB3 88092309	MW15 9-9-88 DANGB-8-MW15-GW-1 88092317	MW15 FB 9-9-88 DANGB-FB4 88092331	MW16 9-9-88 DANGB-8-MW16-GW-1 88092315	MW17 9-9-88 DANGB-8-MW17-GW-1 88092314	MW17 FB 9-9-88 DANGB-FB5 88092332	GW 8-A 9-10-88 DANGB-8-GW8A-GW-1 88092327	GW 8-B 9-10-88 DANGB-8-GW8B-GW-1 88092323
Date Collected	8 Sep 88	8 Sep 88	8 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	9 Sep 88	10 Sep 88	10 Sep 88
Barium (SW 6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	17 Oct 88	17 Oct 88	Analysis Not	17 Oct 88	Analysis Not	17 Oct 88	17 Oct 88	Analysis Not	18 Oct 88	18 Oct 88
Elapsed Time	29 Days	29 Days	Requested	38 Days	Requested	38 Days	38 Days	Requested	38 Days	38 Days
Cadmium (SW 7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	24 Oct 88	21 Oct 88	Analysis Not	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88
Elapsed Time	36 Days	33 Days	Requested	45 Days	Requested	45 Days	45 Days	Requested	44 Days	44 Days
Chromium (SW 7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	28 Oct 88	28 Oct 88	Analysis Not	28 Oct 88	Analysis Not	28 Oct 88	28 Oct 88	Analysis Not	1 Nov 88	1 Nov 88
Elapsed Time	40 Days	40 Days	Requested	49 Days	Requested	49 Days	49 Days	Requested	52 Days	52 Days
Lead (SW 7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION									
Date Analyzed	20 Oct 38	20 Oct 88	Analysis Not	26 Oct 88	Analysis Not	20 Oct 88	20 Oct 88	Analysis Not	20 Oct 88	20 Oct 88
Elapsed Time	32 Days	32 Days	Requested	47 Days	Requested	41 Days	41 Days	Requested	40 Days	40 Days

TABLE N-20
(Continued)

	GW 8-C 9-9-88 DANGB-GW8C-GW-1 88092313	TB1 9-9-88 DANGB-TB2 88092330	BR1 9-10-88 DANGB-BR3 88092324	BR2 9-9-88 DANGB-BR2 88092316
Date Collected	9 Sep 88	9 Sep 88	10 Sep 88	9 Sep 88
Barium (SW 6010)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed				
Elapsed Time	17 Oct 88	Analysis Not	18 Oct 88	17 Oct 88
	38 Days	Requested	38 Days	38 Days
Cadmium (SW 7131)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	24 Oct 88	Analysis Not	24 Oct 88	24 Oct 88
Elapsed Time	45 Days	Requested	44 Days	44 Days
Chromium (SW 7191)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	28 Oct 88	Analysis Not	1 Nov 88	28 Oct 88
Elapsed Time	49 Days	Requested	52 Days	49 Days
Lead (SW 7421)	ANALYZE WITHIN 180 DAYS OF COLLECTION			
Date Analyzed	20 Oct 88	Analysis Not	20 Oct 88	20 Oct 88
Elapsed Time	41 Days	Requested	40 Days	41 Days

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SECTION N.3

SAMPLE CONTAMINATION

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SECTION N.3
SAMPLE CONTAMINATION

Several compounds were detected which are thought to be non-representative of on-site contamination. These compounds are dichloromethane, chloroform, toluene, and bis(2-ethylhexyl)phthalate. Tables N-21 through N-32 give the detection of these compounds at all sites in all media. Each of these compounds is discussed in the following sections.

N.3.1 Dichloromethane

Dichloromethane was found at low levels in surface water, sediment, soil and ground-water samples from all sites and from airport area and background locations (Tables N-21 through N-32). It was also detected in the laboratory blank for each sample in which it was detected. Laboratory contamination would appear to be the source of this compound.

N.3.2 Chloroform

Chloroform was detected at low levels in the surface water at Site 3 (Table N-21); in the sediment at an Area location, Site 4 and Site 8 (Table N-21); and in the soil and ground water at area background locations (Tables N-23 and N-28), Site 2 (Tables N-24 and N-29), Site 3 (Tables N-25 and N-30), Site 4 (Tables N-26 and N-31) and Site 8 (Tables N-27 and N-32).

With a few exceptions, chloroform was also found in the laboratory blanks of the samples in which it was detected. The exceptions are one surface water sample from Site 4 at 3 ug/L, a sediment sample from one airport area location at 1.5 ug/L, one sediment sample from Site 4 at 16 ug/L and three sediment samples from Site 8 at 14, 14, and 27 ug/L; five soil samples from Site 3 at 0.20, 0.50, 3.50, 1.10, and 0.56 ug/L; two ground-water samples from Site 3 at 1.3, 0.25, 1.4 ug/L and one ground-water sample from Site 4 at 0.18 ug/L. All these levels, including the three from the sediment samples at Site 8 are very low and are thought to be a result of laboratory contamination.

N.3.3 Toluene

The distribution of the occurrence of toluene is unusual. The detections of toluene in surface water, sediment and ground-water samples are given in Table N-22.

In the Area/Background samples, toluene was detected only in one surface water sample which is most likely associated with a small localized spill

(Section 4.2.1). At Site 2 toluene was not detected in the surface water, sediment or ground-water samples.

At Site 3 toluene was detected in samples from two wells and in the duplicate sample from one of them. These detections are due to contamination at the Site 3 storage pad (Section 4.4.5.1).

At Site 4 toluene was detected at very low levels in two surface water samples and at amounts which varied from undetected to 54,000 ug/L in the sediment samples. This contamination is to be expected from a fuel spill (Section 4.5.2.1).

At Site 8 toluene was not detected.

The detection of toluene in soil are given in Tables N-23 through N-27. These detections occur at various sample depths and do not appear to be related to other contaminants, known contaminant sources or to laboratory contamination. However, all soil samples were obtained during the first part of the field program, during which time almost all of the soil samples were obtained. During this time period black electrical tape was used to seal the sample containers. The field personnel used white tape to seal surface water, sediment and ground-water sample containers all of which were collected during the last few weeks of the field period. It was noted during its use that the black tape had a strong odor. Subsequent qualitative testing of the black tape on a field GC instrument has substantiated that the black tape did show high levels of toluene. This leads to the conclusion that the toluene levels reported in the soil samples are probably due to the black tape used to seal the sample bottles.

TABLE N-21

DICHLOROMETHANE AND CHLOROFORM CONCENTRATIONS DETECTED AT ALL SITES SURFACE WATER AND SEDIMENT SAMPLES

(Sediment results in micrograms per kilogram;
water results in micrograms per liter.)

Sample Location	Dichloromethane		Chloroform	
	Water	Sediment	Water	Sediment
DANGB-BG-SL1	U	34 B	U	U
DANGB-BG-SL2	U	69 B	U	U
DANGB-BG-SL3	6.9 B	0.77 B	U	U
DANGB-BG-SL4	U	42 B	U	1.5
DANGB-BG-SL5	U	62 B	U	U
DANGB-2-SL6	U	65 B	U	U
DANGB-2-SL7	0.24 B	52 B	U	U
DANGB-3-SL8	0.26 B	23 B	U	U
DANGB-3-SL9	0.58 B	26 B	U	U
DANGB-3-SL10	U	37 B	U	U
DANGB-4-SL11	1.0 B(1)	60 B	U(2)	U
DANGB-4-SL12	1.0 B	27 B	U	U
DANGB-4-SL13	45.0 B	46 B	U	U
DANGB-4-SL14	1.6 B	59 B	U	14 B
DANGB-4-SL15	36.0 B	40 B	3	U
DANGB-4-SL16	0.5 B	50 B	U	16
DANGB-8-SL17	1.7 B	36 B	U	14
DANGB-8-SL18	U	34 B	U	14
DANGB-8-SL19	1.9 B	98 B	U	27

1. B indicates the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but not detected.

TABLE N-22
TOLUENE CONCENTRATIONS DETECTED
AT ALL SITES IN SURFACE WATER,
SEDIMENT AND GROUND-WATER SAMPLES
(Sediment results in micrograms per kilogram;
water results in micrograms per liter.)

Location	Medium	Concentration
Airport Area		
DANGB-BG-SL3	Surface Water	19
Background		
None		
Site 2		
None		
Site 3		
GW 3-B	Ground Water	21
GW 3-B DUP	Ground Water	20
GW 3-D	Ground Water	2.9
Site 4		
DANGB-4-SL11	Surface Water	4.3
DANGB-4-SL13 DUP	Surface Water	2.3
DANGB-4-SL11	Sediment	970
DANGB-4-SL12	Sediment	360
DANGB-4-SL13	Sediment	54,000
DANGB-4-SL13 DUP	Sediment	26,000
DANGB-4-SL14	Sediment	U
DANGB-4-SL15	Sediment	5.5
DANGB-4-SL16	Sediment	U
Site 8		
None		

TABLE N-23

TOLUENE, DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN

AREA/BACKGROUND SOIL SAMPLES

(Results in micrograms per kilogram.)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-BG-MW32			
SS1 2 to 3 feet	28	4.1 B(1)	U(2)
SS2 11 to 12 feet	47	4.0 B	U
SS3 19 to 20 feet	31	1.5 B	U
DANGB-BG-MW42			
SS1 0 to 1 foot	1.8 B	1.3 B	U
SS2 7 to 8 feet	(1)	0.29 B	U
SS3 14.5 to 15.5 feet	198 B	2.2 B	0.22 B
DANGB-BG-MW43			
SS1 1 to 2 feet	25 B	3.1 B	U
SS2 14 to 15 feet	8.3 B	4.8 B	0.12 B
SS3 23 to 24 feet	160 B	7.4 B	U

1. B indicates the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but was not detected.

TABLE N-24

TOLUENE, DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN SITE 2 SOIL SAMPLES

(Results in micrograms per kilogram.)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-BG-MW12A			
SS1 2 to 3 feet	3.1	1.0 B(1)	0.06 B
SS3 5 to 15 feet	2.1	1.6 B	U(2)
SS5 15 to 20 feet	2.3	1.7 B	0.12 B
DANGB-2-MW13A			
SS1 0 to 2 feet	19	9.9 B	U
SS3 8 to 10 feet	13	4.3 B	U
SS4 14 to 15 feet	4.9	4.4 B	U
DANGB-2-MW37			
SS1 0 to 1 foot	38	6.0 B	0.17 B
SS2 5 to 6 feet	90	2.9 B	U
SS3 16 to 17 feet	64	2.1 B	U
SS4 17.5 to 18 feet	56	2.2 B	U
DANGB-2-MW39			
SS1 0 to 1 foot	1.4	18.0 B	U
SS2 9 to 10.5 feet	520	4.6 B	U
SS4 17 to 19 feet	12	49.0 B	U
DANGB-2-MW40			
SS1 0 to 1 foot	37	4.4 B	1.30 B
SS2 5 to 6 feet	8.8	0.9 B	U
SS3 15.5 to 16.5 feet	8.9	4.4 B	0.10 B
DANGB-2-MW41			
SS1 0 to 5 feet	4.2	6.8 B	0.60 B
SS2 5 to 15 feet	57	5.4 B	0.50 B
SS3 15 to 20 feet	47	3.4 B	U
DANGB-2-BH1 R			
SS1 0 to 2 feet	2,000 B	5.2 B	U
SS2 2 to 4 feet	640 B	2.6 B	U
SS3 6 to 8 feet	15,000	12.0 B	1.70 B
SS4 8 to 10 feet	1,700	2.2 B	0.90 B
SS5 10 to 12 feet	1,100	7.3 B	0.60 B
SS6 15 to 17 feet	200	21.0 B	0.44 B
SS7 22 to 24 feet	1.7	2.1 B	1.40 B

TABLE N-24 (continued)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-2-BH2 R			
SS1 0 to 2 feet	36,000	7.8 B	1.30 B
SS2 5 to 6 feet	7,200	19.0 B	U
SS3 10 to 12 feet	570	4.0 B	33.00 B
SS4 14 to 15 feet	U	1.5 B	1.70 B
SS5 20 to 22 feet	4.0	3.2 B	0.43 B
SS6 24 to 25 feet	11	1.9 B	0.33 B

1. B indicates that the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but was not detected.

TABLE N-25

TOLUENE, DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN SITE 3 SOIL SAMPLES

(Results in micrograms per kilogram.)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-3-MW25			
SS1 0 to 1 foot	U(1)	2.50B(2)	U
SS2 2 to 3 feet	U	U	U
SS3 14 to 15 feet	U	U	U
DANGB-3-MW27			
SS1 0 to 1 foot	610	3.00 B	U
SS2 5 to 6 feet	740	1.90 B	U
SS3 14 to 15 feet	100	120 B	U
DANGB-3-MW28			
SS1 0 to 1 foot	5.5	3.10 B	U
SS2 2 to 3 feet	60	2.20 B	U
SS3 14 to 15 feet	23	1.70 B	0.24 B
DANGB-3-MW29			
SS1 0 to 1 foot	18	0.94 B	U
SS2 3 to 4 feet	38	0.57 B	U
SS3 14 to 15 feet	7.0	0.67 B	U
DANGB-3-MW30			
SS1 0 to 1 foot	U	1.20 B	U
SS2 9 to 11 feet	U	U	U
SS3 14 to 15 feet	20	1.20 B	U
DANGB-3-MW31			
SS1 0 to 1 foot	9.8	5.90 B	U
SS2 9 to 10 feet	60	2.30 B	0.43 B
DANGB-3-MW33			
SS1 0 to 1 foot	150	3.90 B	U
SS2 11 to 12 feet	28	2.60 B	U
SS3 20 to 21 feet	9.4	4.10 B	U
DANGB-3-MW35			
SS1 0 to 1 foot	18	9.20 B	U
SS2 2 to 3 feet	13	81.00 B	U
SS3 10 to 11.5 feet	79	8.60 B	0.09 B
DANGB-3-SGA0	17	3.40 B	0.20 B
DANGB-3-SGA1	8.5	8.80 B	U
DANGB-3-SGA2	3.4	2.00 B	U
DANGB-3-SGA3	12	2.50 B	0.80 B

TABLE N-25 (continued)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-3-SGA4	1.6	12.00 B	0.20 B
DANGB-3-SGA5	39	25.00 B	0.20
DANGB-3-SGB1	4.5	5.70 B	2.60 B
DANGB-3-SGB2	U	U	U
DANGB-3-SGB3	36	5.80 B	1.10 B
DANGB-3-SGC0	6.7	3.90 B	U
DANGB-3-SGC1	8.1	1.90 B	U
DANGB-3-SGC2	5.3	12.0 B	0.20 B
DANGB-3-SGC3	4.2	1.70 B	U
DANGB-3-SGC5	190	11.0 B	U
DANGB-3-SGD0	20 B	1.30 B	U
DANGB-3-SGD1	12 B	1.40 B	U
DANGB-3-SGD2	U	3.40 B	U
DANGB-3-SGD4	8.6	6.60 B	U
DANGB-3-SGD5	12	5.80 B	0.50
DANGB-3-SGE0	3.1 B	1.40 B	U
DANGB-3-SGE1	53 B	3.50 B	U
DANGB-3-SGE2	38 B	1.30 B	0.23 B
DANGB-3-SGE3	8.8	5.40 B	U
DANGB-3-SGE4	140	4.60 B	3.50
DANGB-3-SG49	1,300 B	2.40 B	U
DANGB-3-SG54	12	9.10 B	U
DANGB-3-SG55	U	4.30 B	0.20 B
DANGB-3-SG58	U	U	0.30 B

1. U indicates that the compound was undetected above the level of the practical quantitation limit.
2. B indicates the compound was detected in the laboratory blank.

TABLE N-26

TOLUENE, DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN SITE 4 SOIL SAMPLES

(Results in micrograms per kilogram)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-4-MW21			
SS1 0 to 1 foot	330	6.7 B[1]	U[2]
SS2 5 to 7 feet	120	3.5 B	U
SS3 18 to 19 feet	53	2.8 B	U
DANGB-4-MW22			
SS1 0 to 1 foot	120	17.0 B	U
SS2 5 to 7 feet	100	4.6 B	1.10
SS3 30 to 31 feet	830	6.0 B	0.56
DANGB-4-MW23			
SS1 0 to 1 foot	1.2	8.4 B	U
SS2 8 to 9 feet	25	3.2 B	0.40 B
SS3 30 to 31 feet	13	5.4 B	0.08 B
DANGB-4-MW24			
SS1 0 to 2 feet	39	2.9 B	U
SS2 3 to 4 feet	150	4.3 B	U
SS3 32 to 34 feet	950	3.6 B	U

1. B indicates the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but not detected.

TABLE N-27

TOLUENE, DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN SITE 8 SOIL SAMPLES

(Results in micrograms per kilogram.)

Sample Location	Toluene	Dichloromethane	Chloroform
DANGB-8-MW14			
SS1 0 to 1 foot	1,400	13.00 B[1]	U[2]
SS3 10 to 12 feet	9.4	3.00 B	U
SS8 38 to 40 feet	23.0	4.30 B	U
DANGB-8-MW16			
SS1 0 to 1 foot	15.0	5.10 B	U
SS2 4 to 5 feet	41.0	10.00 B	U
SS6 29 to 30 feet	7.5	4.10 B	U
DANGB-8-MW18			
SS1 0 to 2 feet	2.0	3.30 B	U
SS2 8 to 11 feet	84.0	5.10 B	U
SS3 14 to 15 feet	81.0	4.40 B	U
DANGB-8-MW19			
SS1 0 to 2 feet	10.0	10.00 B	0.50 B
SS2 6.5 to 7.5 feet	1.7	3.20 B	0.05 B
SS3 9 to 10 feet	4.4	3.20 B	0.04 B
DANGB-8-MW20			
SS1 0 to 2 feet	15.0	3.40 B	U
SS2 6 to 8 feet	120.0	0.35 B	U
SS4 15 to 20.5 feet	720.0	3.60 B	U

1. B indicates the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but not detected.

TABLE N-28

DICHLOROMETHANE AND CHLOROFORM CONCENTRATIONS

DETECTED IN AREA/BACKGROUND GROUND-WATER SAMPLES

(Results are in micrograms per liter.)

Sample Location	Dichloromethane	Chloroform
DANGB-BG-MW32	2.2 B(1)	U(2)
DANGB-BG-MW42	0.98 B	1.0 B
DANGB-BG-MW43	1.6 B	U

1. B indicates the compound was detected in the laboratory blank.
2. U indicates compound was analyzed for but not detected.

TABLE N-29

DICHLOROMETHANE AND CHLOROFORM CONCENTRATIONS

DETECTED IN SITE 2 GROUND-WATER SAMPLES

(Results are in micrograms per liter.)

Sample Location	Dichloromethane	Chloroform
MW 2	0.42 B(1)	U(2)
MW 5	0.53 B	U
GW 2-D	0.80 B	U
DANGB-2-MW37	U	0.32 B
DANGB-2-MW38	0.96 B	0.86 B
DANGB-2-MW40	0.85 B	U
DANGB-2-MW41	U	0.15 B

1. B indicates the compound was detected in the laboratory blank.
2. U indicates compound was analyzed for but not detected.

TABLE N-30

DICHLOROMETHANE AND CHLOROFORM CONCENTRATIONS

DETECTED IN SITE 3 GROUND-WATER SAMPLES

(Results are in micrograms per liter.)

Sample Location	Dichloromethane	Chloroform
GW 3-B	0.50 B(1)	U(2)
GW 3-C	U	2.8 B
GW 3-D	0.29 B	U
DANGB-3-MW25	1.6 B	U
DANGB-3-MW26	0.93 B	U
DANGB-3-MW27	0.50 B	U
DANGB-3-MW29	0.32 B	U
DANGB-3-MW30	U	1.3
DANGB-3-MW31	U	0.33 B
DANGB-3-MW33	0.50 B	0.25
DANGB-3-MW34	0.51 B	1.4

1. B indicates the compound was detected in the laboratory blank.
2. U indicates compound was analyzed for but not detected.

TABLE N-31

DICHLOROMETHANE AND CHLOROFORM

CONCENTRATIONS DETECTED IN SITE 4 GROUND-WATER SAMPLES

(Results are in micrograms per liter.)

Sample Location	Dichloromethane	Chloroform
MW 8	0.67 B[1]	U[2]
MW 9	0.37 B	U
MW 10	0.04 B	U
MW 11	0.37 B	U
GW 4-A	0.31 B	U
GW 4-B	0.50 B	U
GW 4-D	0.49 B	U
DANGB-4-MW21	2.60 B	U
DANGB-4-MW22	0.69 B	0.23 B
DANGB-4-MW23	5.30 B	U
DANGB-4-MW24	4.10 B	0.18

1. B indicates the compound was detected in the laboratory blank.
2. U indicates that the compound was analyzed for but not detected.

TABLE N-32

DICHLOROMETHANE AND CHLOROFORM CONCENTRATIONS

DETECTED IN SITE 8 GROUND-WATER SAMPLES

(Results are in micrograms per liter.)

Sample Location	Dichloromethane	Chloroform
GW 8-A	1.60 B(1)	U(2)
GW 8-B	0.46 B	U
GW 8-C	2.20 B	U
DANGB-8-MW14	1.70 B	U
DANGB-8-MW15	2.80 B	U
DANGB-8-MW16	0.12 B	0.14 B
DANGB-8-MW17	0.77 B	0.16 B

1. B indicates the compound was detected in the laboratory blank.
2. U indicates compound was analyzed for but was not detected.

N.3.4 Bis(2-ethylhexyi)phthalate

The surface water and ground-water samples in which bis(2-ethylhexyl)phalate was detected also had, with one exception, this compound detected in the laboratory blank (Table N-33). On the other hand, detections of this compound in either sediment or soil did not have detections in the associated laboratory blanks. Therefore, the detections in water appear to be due to laboratory contamination. Bis(2-ethylhexyl)phthalate does appear to be present in the sediment and soil.

TABLE N-33
BIS(2-ETHYLHEXYL)PHTHALATE
CONCENTRATIONS DETECTED IN
AREA/BACKGROUND, SITE 2 AND SITE 3 SURFACE WATER
AND GROUND-WATER SAMPLES
(results in micrograms per liter.)

Sample Location	Medium	Concentration
Area/Background		
MW42	Ground Water	10 B
MW43	Ground Water	13
Site 2		
MW 1	Ground Water	15 B
MW 2	Ground Water	10 B
MW 5	Ground Water	14 B
MW 39	Ground Water	100 B
Site 3		
SL 10 DUP	Surface Water	10 B
GW 3-B	Ground Water	17 B
GW 3-B DUP	Ground Water	19 B
MW 27	Ground Water	42 B
MW 28	Ground Water	23 B
MW 31	Ground Water	62 B

SECTION N.4
DATA VALIDATION

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SECTION N.4
DATA VALIDATION

The data validation is presented in this section. Data validations are presented in the following sections by type of compound. The quality control data on which the validation was done is located in the Data Packages in Appendix M.

N.4.1 Volatile Organic Analyses

Results were validated against U. S. Environmental Protection Agency, Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses, May 28 1985.

N.4.1.1 Holding Times

All volatile organic compounds were validated against a 14-day holding time as required by the SW-846 8010/8020 methods. The holding time data are given in Tables N-1 through N-20. All samples met the required holding times.

N.4.1.2 GC/MS Tuning

The volatile organic analyses were performed by GC methods and did not require tuning of the instrument.

N.4.1.3 Calibration

Initial and continuing calibration checks documented satisfactory maintenance and adjustment of the instrument on a day-to-day basis in the 10% of samples checked.

N.4.1.4 Blanks

Two volatile organic compounds, dichloromethane and chloroform were frequently detected in varying concentrations in numerous soil and water samples. Several other volatile organic compounds were detected less frequently. In addition, many of these same compounds were detected in varying concentrations in laboratory blanks, field blanks, rinseate blanks, and trip blanks. This variation was in a randomly distributed pattern. This same random pattern was also evident in duplicates and background samples. This supports the hypothesis that these frequently detected compounds are the result of common laboratory contamination. and the presence of the other compounds in the blanks is the result of isolated occurrences. Neither of these should affect other data.

All blanks were evaluated against the guidelines and results were flagged as per the guidelines. Field blank, bailer rinseate blank and trip blank data are

presented in Appendix L.

N.4.1.5 Surrogate Recoveries

The surrogate used for methods SW 601/8010 was 1-chloro-2-bromopropane and the surrogate used for methods 602/8020 was a-a-a-trifluorotoluene. Temporary control limits were established for these surrogates based on the results of surrogate recoveries on the blank spikes. Control limits established on blank spikes will actually be tighter than those established by multiple laboratories on multiple matrices. The control limits were set at ± 3 standard deviations from the mean, and are as follows:

Method 601	67-117% Recovery (water)
Method 602	65-133% Recovery (water)
Method 8010	43-124% Recovery (soil)
Method 8020	31-148% Recovery (soil)

All surrogates were validated against these criteria, and samples outside these recovery limits were flagged.

N.4.1.6 Matrix Spike/Matrix Spike Duplicate

All matrix spikes/matrix spike duplicates (MS/MSD) were evaluated in conjunction with other QC criteria. Anytime a MS or MSD was outside recovery limits, the MS/MSD on the associated blank spike was reviewed. If the blank spike showed the laboratory to be in control, the results were accepted. If the blank spike showed the laboratory to be out of control, the sample(s) were reanalyzed.

N.4.1.7 Compound Identification

Roughly 10% of the positive values were reviewed with no problems detected. Second column confirmation was performed on all positive results as required. Instances where second column confirmations were conducted are given in Tables N-1 through N-20.

N.4.1.8 System Performance

One problem appeared that could not be explained or corrected through data validation. A large portion of soil samples showed varying levels of toluene. It was noted by field personnel that black electrical tape was used to seal the bottles containing the soil samples, while a white tape was used to seal all of the other samples. It was also noted in the field that the black tape had a strong odor. Subsequent qualitative testing of the tape on a field GC instrument has substantiated that the black tape did indeed show high levels of toluene. This leads to the conclusion that the toluene levels reported

in the soil samples are probably a result of the black tape used to seal the sample bottles.

N.4.2 Semi-Volatile Organic Analyses

Results were validated against U. S. Environmental Protection Agency, Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses, May 28 1985.

N.4.2.1 Holding Times

All semi-volatile organic analyses were validated against a 7-day holding time for extraction of water samples; a 14-day holding time for extraction of soil and sediment samples; and a 40-day holding time for analysis from verified time of sample receipt. The holding time data are given in Tables N-1 through N-20. A major portion of the semi-volatile organic analyses missed holding times and were flagged according to the guidelines. Most of the samples missed holding times because the samples had to be re-extracted and re-analyzed due to QC values outside control limits.

N.4.2.2 GC/MS Tuning

Batches of data were analyzed with associated DFTPP tunes that met ion abundance criteria in the 10% of samples checked.

N.4.2.3 Calibration

Initial and continuing calibration checks documented satisfactory maintenance and adjustment of the instrument on a day-to-day basis in the 10% of samples checked.

N.4.2.4 Blanks

One semi-volatile organic compound was frequently detected in varying concentrations in both soil and water samples. That compound was bis(2-ethylhexyl)phthalate. Many phthalate esters are common laboratory contaminants and there are precise reporting criteria for them. All blanks were evaluated against these guidelines, and results were flagged as per the guidelines.

N.4.2.5 Surrogate Recoveries

All semi-volatile organic surrogates were validated against the "Laboratory Data Validation, Function Guidelines for Evaluating Organic Analyses", May 1985, and data were flagged according to these guidelines.

N.4.2.6 Matrix Spike/Matrix Spike Duplicate

All matrix spike/matrix spike duplicates (MS/MSD) were evaluated in conjunction with other QC criteria. Anytime a MS or MSD was outside

recovery limits, the MS/MSD on the associated blank spike was reviewed. If the blank spike showed the laboratory to be in control, the results were accepted. If the blank spike showed the laboratory to be out of control, the samples were reanalyzed.

N.4.2.7 Compound Identification

The positive values were reviewed with no problems detected. Instances where second column confirmations were conducted can be identified using Tables N-1 through N-20.

N.4.2.8 System Performance

The major problem that occurred was that many samples had to be re-extracted and re-analyzed outside of holding times.

N.4.3 Pesticide/PCB Data Validation

Results were validated against U. S. Environmental Protection Agency, Laboratory Data Validation, Functional Guidelines for Evaluating Pesticides/PCBs Analyses, May 28 1985.

N.4.3.1 Holding Times

All pesticide and PCB analyses were validated against a 7-day holding time for extraction of water samples; a 14-day holding time for extraction of soil and sediment samples; and a 40-day holding time for analysis from verified time of receipt. The holding time data are given in Tables N-1 through N-20. Several of the pesticide and PCB samples missed holding times because they had to be re-extracted and re-analyzed due to QC values outside of control limits. The samples that missed holding times were flagged according to protocol.

N.4.3.2 Pesticide Instrument Performance

Roughly 10% of the retention time window data was reviewed with no evidence of significant problems.

N.4.3.3 Calibration

Initial and continuing calibration checks were reviewed and there were no apparent problems.

N.4.3.4 Blanks

All of the pesticide and PCB blanks were reviewed. None of the blanks showed any compounds above detection limits.

N.4.3.5 Surrogates

All surrogate recoveries were reviewed. Although some recoveries were outside of control limits, the surrogate is for advisory purposes only and no

data were flagged. The results were evaluated by the laboratory at the time of analysis, and in most cases the blank spike showed the laboratory to be in control; other validation parameters were also within acceptable control limits.

N.4.3.6 Matrix Spike/Matrix Spike Duplicate

All of the matrix spike/matrix spike duplicates were evaluated against criteria. Several problems existed, however, none of these should affect data quality. The problems were as follows:

a) The relative percent difference (RPD) and/or the percent recoveries (PR) for several spikes exceed the control limits, however, a blank spike analysis showed the laboratory to be in control in each case.

b) Heptachlor epoxide was inadvertently used instead of heptachlor in the matrix spiking solution.

c) In several samples, endrin aldehyde and kepone were not recoverable because they were removed by the alumina column clean-up that had to be used on the samples.

d) In several cases, the samples were apparently double-spiked with matrix compounds.

N.4.3.7 Compound Identification

Retention time windows were reviewed on samples that showed positive values and required second column confirmation. No problems were observed. Instances where second column confirmations were conducted are given in Tables N-1 through N-20.

N.4.4 Total Petroleum Hydrocarbon Analyses Validation

Total petroleum hydrocarbon results were evaluated against U. S. Environmental Protection Agency, Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses, May 28 1985.

N.4.4.1 Holding Times

All total petroleum hydrocarbon analyses were evaluated against a 28-day holding time for water samples, and no specified holding time for soil and sediment samples. The Remedial Investigation Work Plan (ES, 1988) specified a 14-day holding time for soil samples. This is incorrect, as there is no specified holding time for soil samples for the 418.1 method. The holding time data are given in Tables N-1 through N-20. All of the samples met holding times.

N.4.4.2 Calibration

All initial and continuing calibration data was reviewed. All of the

continuous calibration verification (CCV) values were within the required 80-120% window.

N.4.4.3 Blanks

All of the blanks were evaluated and found to be less than detection limits.

N.4.4.4 Duplicates

All of the duplicates were within the ±20% relative percent difference (RPD) required.

N.4.4.5 Matrix Spike/Matrix Spike Duplicate

All of the spikes were reviewed. Several spike recoveries were low, but in every case the blank spike was within limits, thus showing the laboratory to be in control. In several cases, there was insufficient volume of sample provided for spikes, so blank spikes were used for quality control purposes in these incidences.

N.4.5 Metals Analyses Validation

Metals results were validated against U. S. Environmental Protection Agency, Laboratory Data Validation, Functional Guidelines for Evaluation Inorganic Analyses, May 28 1985.

N.4.5.1 Holding Times

All metals analyses except for several mercury analyses met holding times. The holding time data are also given in Tables N-1 through N-20. These samples were flagged according to protocol.

N.4.5.2 Initial and Continuing Calibration

All sample batches were within calibration limits.

N.4.5.3 Blanks

All blanks were less than the Contract Required Detection Limit (CRDL).

N.4.5.4 ICP Interference Check Samples

All samples for ICP Analysis were within the ICP Interference Check Sample Limits.

N.4.5.5 Laboratory Control Samples

Several Laboratory Control Samples (LCS) were outside control limits, however, those samples were reanalyzed. All samples reported were analyzed in batches in which the LCSs met criteria, or the blank spike showed the laboratory to be in control.

N.4.5.6 Duplicates

Only two duplicates exceeded the 50% RPD level. However, all of the

analytes reported for the associated samples were less than 5 times the CRDL. No action is necessary.

N.4.5.7 Spikes

Several spikes were outside of control limits; however, post-digestion spikes of the same samples were within limits on all but 3 samples. This is an indication of digestion problems and the method of standard additions was performed as required for quantitation. The post-digestion spikes on the other 3 samples were similar to the original spikes. This indicates a matrix interference and no action was required.

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SECTION N.5
FIELD QUALITY CONTROL SAMPLES

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SECTION N.5
FIELD QUALITY CONTROL SAMPLES

Field quality control samples consisted of trip blanks (TB), field blanks (FB), coded field duplicates (DUP) and bailer rinseate (BR) samples. They can be identified in Tables L-1 through L-21 in which the laboratory results are presented by the designators TB, FB, DUP and BR.

N.5.1 Blanks

Blanks are artificial samples used to monitor the introduction of artifacts into aqueous samples. Two types of blanks were used in this Remedial Investigation. Trip blanks are organic-free, American Society for Testing Materials (ASTM) Type II reagent water samples that are sealed in sample containers at the laboratory. They are taken to the field where they remain sealed and are present during sampling and accompany field samples during transport to the laboratory. Field blanks are analyte-free water samples that are poured into sample containers while on site and are handled like samples. The water used is the same water used for final equipment decontamination rinses. Field blanks are used to monitor the introduction of analytes into sample containers during sampling.

N.5.1.1 Trip Blank Results

Fourteen trip blanks were analyzed for halogenated volatile organic compounds (SW 8010) and aromatic volatile organic compounds (SW 8020).

Bromodichloromethane and Chloroform were each detected in one trip blank at 0.27 and 0.2 ug/L respectively.

Bromoform was detected in six trip blanks at concentrations ranging from 8.1 to 30 ug/L.

Dibromoethane was detected in two trip blanks at concentrations of from 3.1 and 3.6 ug/L.

Dichloromethane was detected in all trip blanks at concentrations ranging from 0.61 to 4.5 ug/L. In each case, dichloromethane was detected in the associated laboratory blank as well as the trip blank, indicating that dichloromethane, was present as a laboratory contaminant.

Dibromochloromethane was detected in four trip blanks at concentrations ranging from 1.3 to 4.7 ug/L.

No aromatic volatile organics were detected in any of the trip blanks.

N.5.1.2 Field Blank Results

Nineteen field blanks were analyzed for halogenated volatile organic compounds (SW 8010) and aromatic volatile organic compounds (SW 8020). Five of the field blanks were filled while taking surface water samples and fourteen were filled while taking ground-water samples. No analytes were detected in the surface water field blanks. Chloroform, a suspected laboratory contaminant, was detected in nine of the field blanks filled during ground-water sampling at concentrations ranging from 13 to 16 ug/L. No other analytes were detected.

N.5.2 Duplicate Sample Results

Coded field duplicates were submitted to the laboratory with bottle labels and chain of custody identifiers different from the actual sample identification. In Tables L-1 through L-21, the field duplicates can be identified by the designation "DUP" following their identifiers. The criteria and considerations by which analyses results from samples and their respective duplicates are acceptably reproduced are similar to that required by laboratory precision evaluation and relative percent difference.

N.5.2.1 Airport Area and Background Locations

At the area locations, one duplicate sample from each media: surface water, sediment, soil and ground water was taken.

Toluene was detected at 1.0 ug/L in the soil duplicate sample but not the soil sample. All other analytes were acceptably reproduced.

All analytes detected in the surface water sample were acceptably reproduced from the duplicate sample.

Chloroform was detected at 14 ug/L in the ground-water duplicate sample, but not the ground-water sample. Butyl benzyl phthalate at 10 ug/L and bis(2-ethylhexyl)phthalate at 13 ug/L were detected in the ground-water sample but not in the duplicate sample. All other analytes were acceptably reproduced.

Chloroform was detected at 1.5 ug/L in the sediment sample but not in the duplicate sample. All other analytes were acceptably reproduced.

N.5.2.2 Site 2

At Site 2 one duplicate each was taken from the surface water and sediment, four duplicate samples were taken from the soil, and two duplicate samples were taken from the ground water.

Diethyl phthalate was detected at 144 ug/L in the Site 4 ground-water

sample but not in the duplicate sample. All other analytes were acceptably reproduced.

All analytes detected in the Site 2 surface water, sediment and soil sample/duplicate pairs were acceptably reproduced.

N.5.2.3 Site 3

At Site 3 one duplicate each was taken from the surface water and sediment, seven duplicate samples were taken from the soil, and two duplicate samples were taken from the ground water.

Chloroform at 3.5 ug/kg, dichlorodifluoromethane at 0.25 ug/kg, toluene at 1.6 ug/kg, 4,4'-DDE at 33 ug/kg, 4,4'-DDT at 75 ug/kg, and total petroleum hydrocarbons at 600 mg/L were detected in the soil samples but not in their respective duplicate samples. Tetrachloroethene at 0.41 ug/kg, and diethyl phthalate at 1500 ug/kg were detected in the duplicate samples but not in their respective soil samples. All other analytes were acceptably reproduced.

Chloroform at 1.8 ug/kg was detected in one of the ground-water samples but not in its respective duplicate sample. All other analytes were acceptably reproduced.

N.5.2.4 Site 4

At Site 4 one duplicate sample each was taken from the surface water and sediment, two duplicate samples were taken from soil, and one duplicate sample was taken from the ground water.

All analytes detected in the sediment sample/duplicate pair were acceptably reproduced.

Xylenes at 4.1 ug/kg were detected in one of the duplicate soil samples but not in its respective sample. All other analytes were acceptably reproduced.

Trichloroethene at 0.98 ug/kg was detected in the surface water sample but not in its respective duplicate. Toluene at 23 ug/L and petroleum hydrocarbons at 2.5 mg/L were detected in the surface water duplicate but not in its respective sample. All other analytes were acceptably reproduced.

All analytes detected in the ground water sample/duplicate pairs were acceptably reproduced.

N.5.2.5 Site 8

At Site 8 one sample each was taken from the surface water and sediment, six duplicate samples were taken from soil and one duplicate sample was taken from the ground water.

All analytes detected in the ground-water sample/duplicate pair were acceptably reproduced.

Chloroform at 120 ug/kg and toluene at 220 ug/kg were detected in a Site 8 soil sample duplicate but not in the respective sample. All other analytes were acceptably reproduced.

All analytes detected in the surface water and sediment sample/duplicate pairs were acceptably reproduced.

N.5.2.6 Site 10

At Site 10, one duplicate sample was taken from the ground water during each sampling round.

N.5.3 Bailer Rinseate Results

Sampling device cleanliness is monitored using bailer rinseate samples. After decontamination, sampling equipment was rinsed using analyte-free water. The rinseate was collected and treated as a sample from the site where the sampling equipment was used. One bailer rinseate sample was collected during area/background sampling activities, two bailer rinseate samples were collected during Site 2 sampling activities, one was collected during Site 3 sampling activities, and two samples each were collected during Site 4 and Site 8 sampling activities.

No analytes were detected in the Site 2 bailer rinseate sample.

Chloroform at 14 ug/L and diethyl phthalate at 15 ug/L were detected in the background bailer rinseate sample.

Chloroform at 11 and 0.87 ug/L was detected in two of the three Site 3 bailer rinseate samples.

Chloroform at 15 ug/L was detected in one of the Site 4 bailer rinseate samples.

No analytes were detected from the Site 8 bailer rinseate samples.

APPENDIX O
SOIL GAS SURVEY

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APPENDIX O

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APPENDIX O

LIST OF FIGURES

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SECTION O.1
INTRODUCTION

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SECTION O.1
INTRODUCTION

As part of the Remedial Investigation conducted at the Duluth Air National Guard Base (ANGE , a soil gas survey (SGS) was performed at Site 3 (DPDO Storage Area C). The purpose of this survey was to optimize the placement of ground water monitoring wells, soil borings, and other sampling points at the site. The objectives of the survey were to:

(1) determine the most probable source of sources of contamination impacting the subsurface soil, ground water, and surface water in the vicinity of the site;

(2) attempt to quantify the concentrations of contaminants present in the soil and ground water beneath the site; and

(3) define the approximate lateral extent and migration direction of the contamination in subsurface soil and ground water.

This appendix includes a summary of the methods used in the collection and analysis of samples followed by a discussion of the results and their implications at the site.

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SECTION O.2
SOIL GAS SURVEY METHODS

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SECTION O.2
SOIL GAS SURVEY METHODS

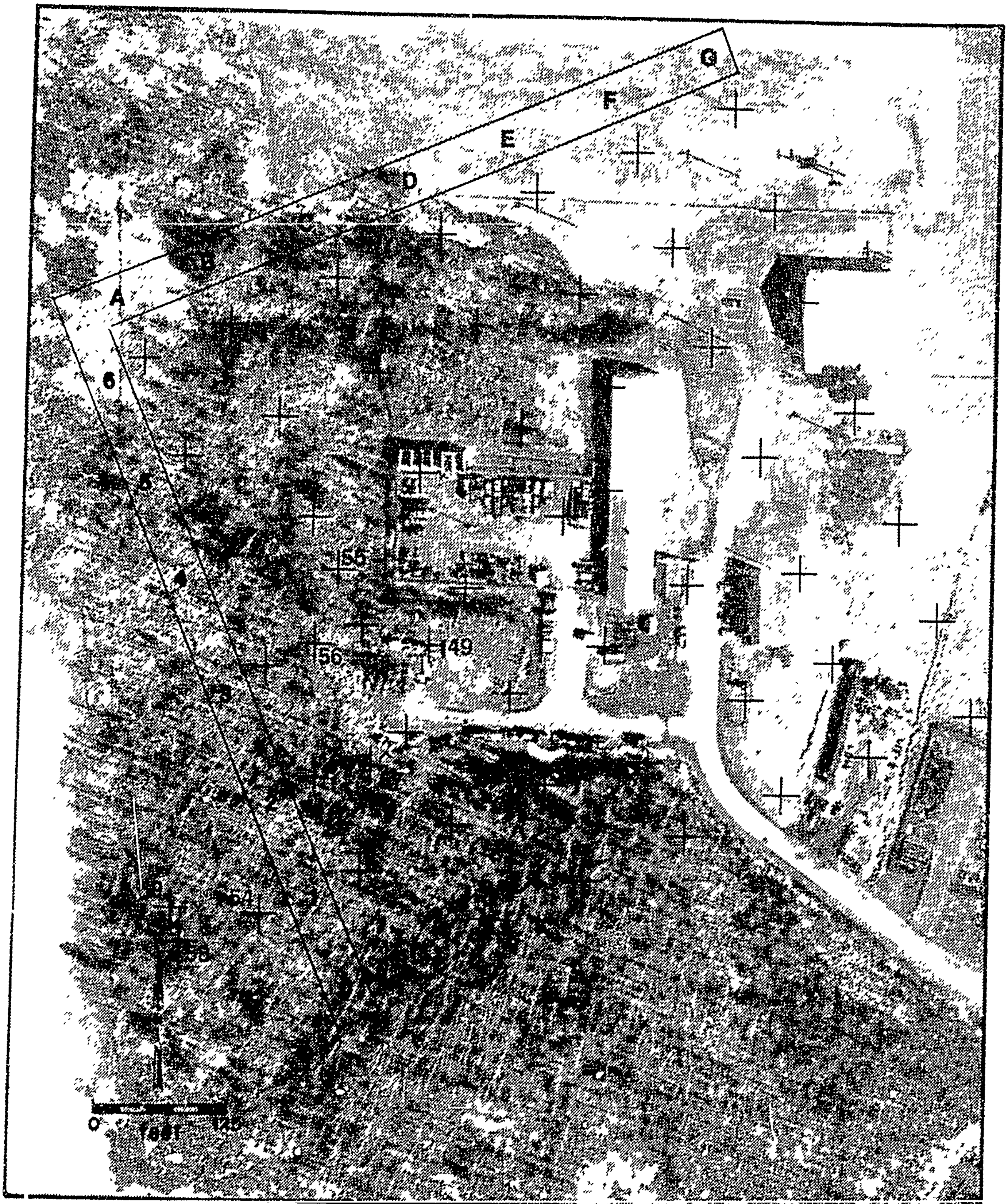
The soil gas survey was conducted at Site 3 between July 7 and 13, 1988. The horizontal extent of volatile organic contamination was investigated by a 57 point soil gas survey over an approximately 600- by 600- foot area. A 49 point grid was established with columns lettered A through G oriented northwest-southeast and rows numbered 0 to 6 oriented northeast to southwest (Figure O-1). Additional points were taken outside the grid structure and are numbered 49, and 53 through 59 on Figure O-1.

Sampling depths were determined by conducting depth profiles at two initial points, points DANGB-3-SGB2 and DANGB-3-SGB3. The profiles were conducted by collecting and analyzing samples at depths ranging from 1 to 8 feet. The purpose of the depth profiling was to identify the contact between the aerobic and anaerobic soil zones. Soil gas samples should be collected below this contact depth where possible for optimal results since aromatic hydrocarbons rapidly decrease in concentration in the aerobic zone due to biodegradation.

Based on the depth profile results, remaining soil gas samples were collected from a depth of 7 feet whenever possible.

Soil gas samples were collected using hollow 0.75-inch stainless steel (type 316) sampling probes inserted mechanically into the soil. After installation of the sampling probe, a vacuum pump was used to withdraw soil gases through the probe into a one liter Tedlar sampling bag. The bags were equipped with septa through which gas samples were withdrawn using a gas-tight syringe. Samples were then injected into a portable gas chromatograph (GC).

Two Photovac portable GC units, model number 10S50 and using photoionization detectors (PIDs) with 10.6 electron-volt (eV) light sources, were used for on-site analysis. The GCs were equipped with isothermal ovens and were set up with precolumn/backflush configurations using CPSil 5CB packed columns. These columns are useful for non-polar hydrocarbons and are recommended by the Photovac corporation for separation of compounds containing 4 to 8 carbon atoms.



EXPLANATION

+ Soil gas sampling location

Figure O-1 Soil Gas Sampling Locations at Site 3.

The following compounds were suspected to occur at the sites and were targeted for calibration and analysis: benzene, toluene, chlorobenzene, m-xylene, o-xylene, 1,1-dichloroethene (DCE), cis-1,2-dichloroethene, trichloroethene (TCE), tetrachloroethene (PCE), and vinyl chloride.

Calibration of the GCs was done in one of two ways. Commercially prepared 1 part per million (ppm) standards were used for calibration of benzene, toluene, chlorobenzene, and o-xylene using a standard prepared by Scott Specialty Gases (mix no. 6670). A second 1 ppm standard (Scott Specialty Gases mix no. 6675) was used for calibration of vinyl chloride, cis-1,2-DCE, and PCE. The remaining two compounds, m-xylene and TCE, were calibrated using a 10 ppm mixture prepared on-site several times daily. This standard was prepared by diluting vapors obtained from the headspace above a volume of pure liquid compound in an airtight vial. The amount of headspace vapor needed to prepare the standard was determined using a table of standard vapor pressures adjusted to the prevailing temperature and barometric pressure. Instrument response was checked by preparing standards for each target compound at higher and lower concentrations in order to construct three-point calibration curves at concentrations approximating those expected in the samples.

Injection volumes and instrument gain settings were adjusted to accommodate the range of concentrations encountered. This was done by prescreening the samples prior to injection into the GCs using a portable organic vapor detector (Photovac TIP), which uses a PID to give an indication of total organic vapors present. The readings obtained were used to adjust injection volumes such that the injections did not saturate the detectors in the GCs. Injection volumes varied from 5 to as much as 2,000 microliters (uL).

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SECTION O.3
QUALITY CONTROL PROCEDURES

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SECTION O.3
QUALITY CONTROL PROCEDURES

A number of quality control procedures were followed to insure the validity of the data obtained during sampling. Three-point calibration curves and data from equipment blanks were used to determine practical detection limits and instrument response. Several types of blanks were routinely analyzed, including instrument, syringe, and bag blanks. Background air was analyzed to determine possible interferences. Decontamination procedures were checked by analyzing samples taken through some or all portions of the sampling train. Spikes were analyzed using particular analytes of interest. A minimum of 10 percent duplicates were analyzed, both by repeating the analysis done on a particular bag and by resampling selected locations at different times. A minimum of 20 percent of the analyses run over the course of a day were for quality control documentation, including all duplicates, spikes, and blanks. Where problems were observed, immediate remedial action was taken to allow sampling to proceed.

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SECTION O.4

RESULTS

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SECTION O.4
RESULTS

The data collected from the soil gas survey were used to generate graphic representations of contaminants in soil gases at the site. Vinyl chloride and 1,1-DCE were not detected at any of the 57 sampling points and are therefore not considered further. The results for the remaining compounds are given in Table O.1 and addressed below.

O.4.1 .NZENE

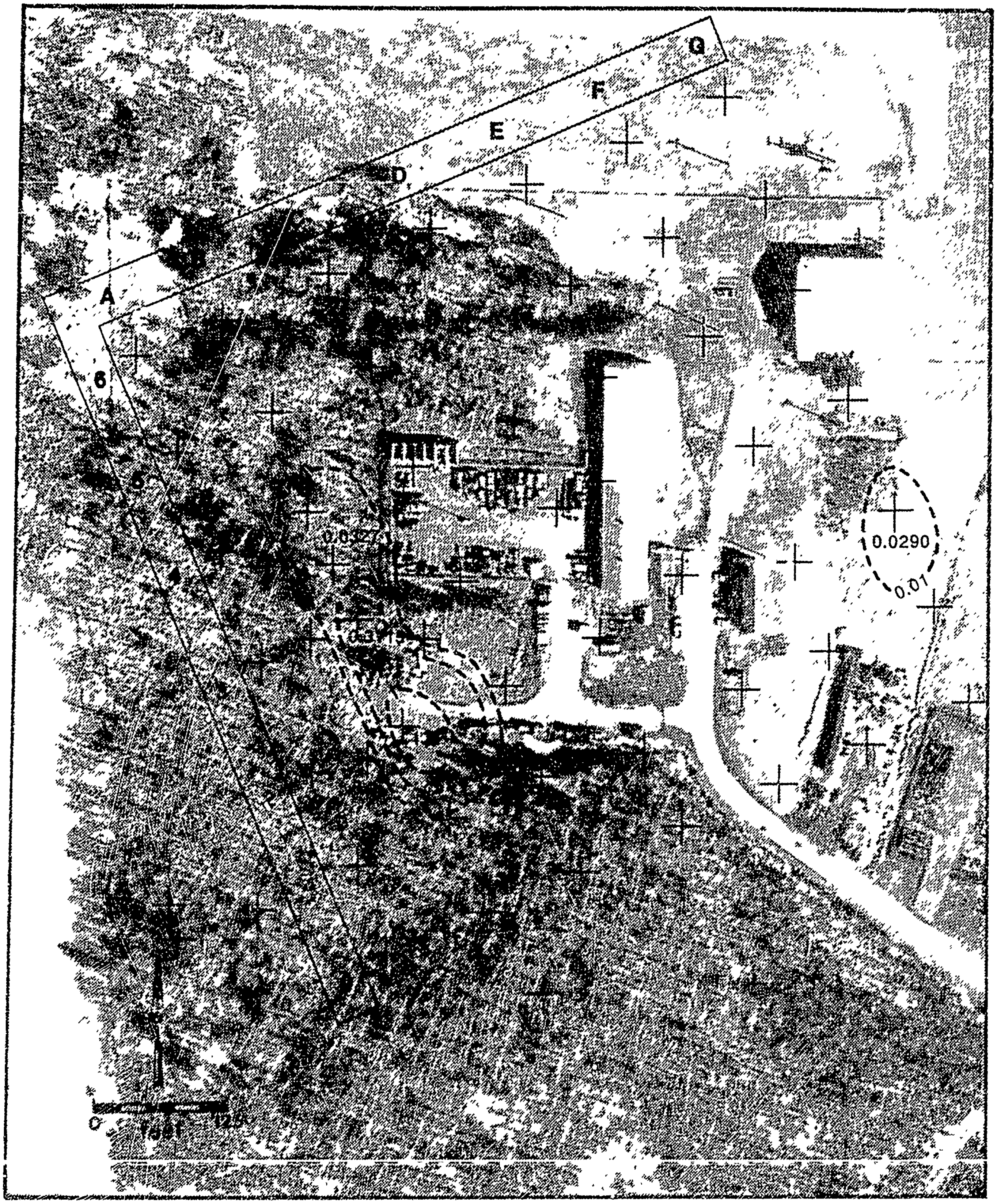
Benzene was detected at four sampling points (Figure O-2). With the exception of point DANGB-3-SGG2, a benzene anomaly extended two hundred feet to the northwest from point DANGB-3-SGB2. Concentrations of benzene ranged from 0.03 ppm at DANGB-3-SGB4 and DANGB-3-SGG2 to 1.4 ppm at point DANGB-3-SGB2. However, four duplicated were run from a 3-foot deep sample at DANGB-3-SGB2 and the concentrations ranged from 0.04 to 1.4 ppm. In samples collected from 5-foot, 6-foot, and 8-foot depths at DANGB-3-SGB2, benzene was not detected in the 5 and 8-foot samples and had a concentration of only 0.02 ppm in the 6-foot sample.

O.4.2 CHLOROBENZENE

Chlorobenzene was detected at concentrations ranged from 0.03 ppm at point DANGB-3-SGD2 to 0.76 ppm at point 49. Chlorobenzene exhibited an anomaly centered near point DANGB-3-SGB2 (Figure O-3) which extended in a southwesterly direction. Secondary anomalies were detected near the center of the site and along the eastern boundary.

O.4.3 CIS-1,2-DICHLOROETHENE (DCE)

Cis-1,2-Dichloroethene was detected only at point DANGB-3-SGB2. The concentration shown in Figure O-4 (6.4 ppm) was the highest concentration observed among seven samples taken from the 3 foot to 8 foot depth intervals. The average concentration in these seven samples was 1.2 ppm.



EXPLANATION

0 029 + Probe point with concentration in ppm. Where no concentration is shown, compound was not detected.

Contour interval = 10x
Contours dashed where inferred

Figure O-2 Concentration of Benzene in Soil Gas at Site 3.

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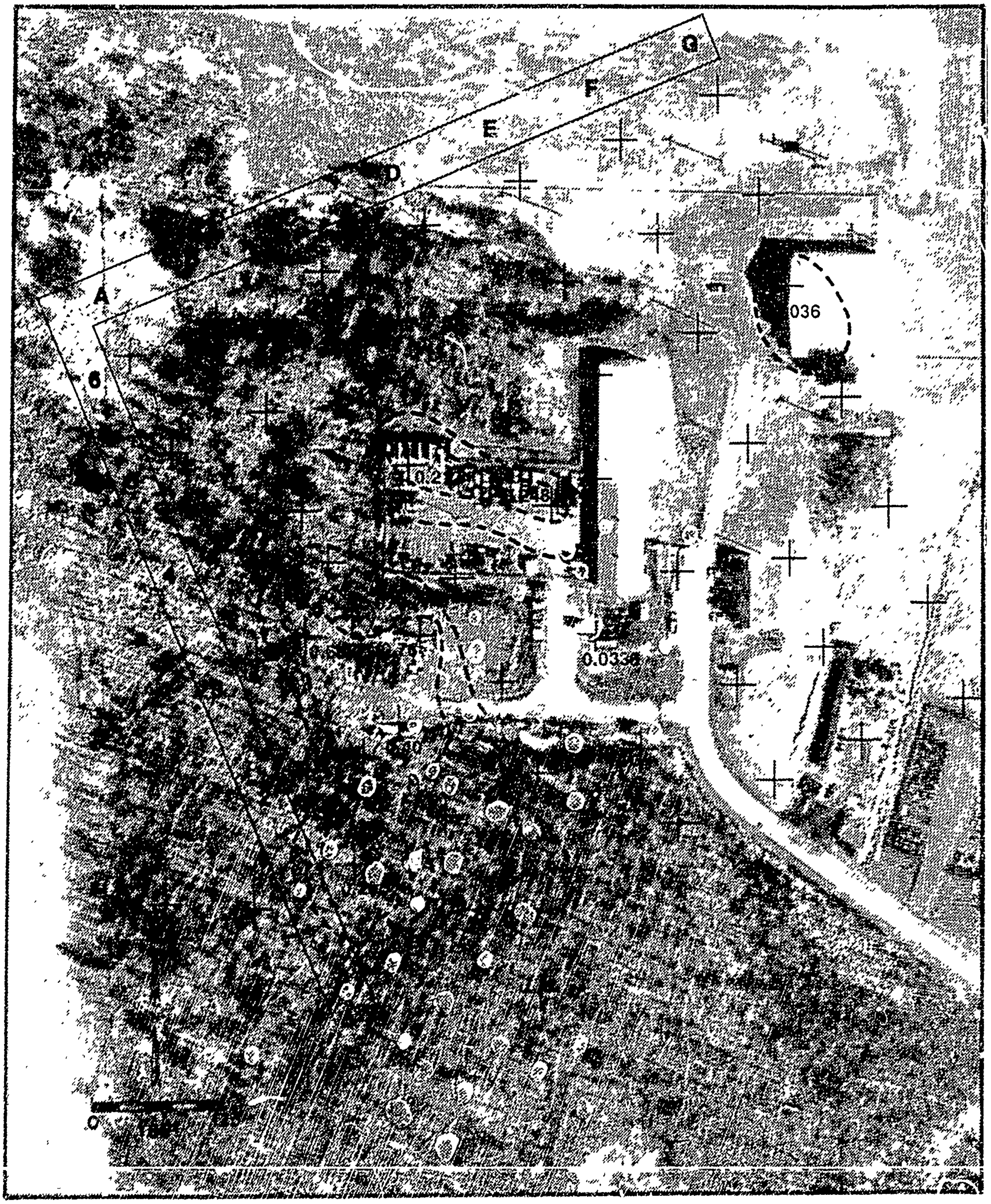

EXPLANATION

0 036 Probe point with concentration in ppm. Where no concentration is shown, compound was not detected.

Contour interval = 10x
Contours dashed where inferred

Figure O-3 Concentration of Chlorobenzene in Soil Gas at Site 3.

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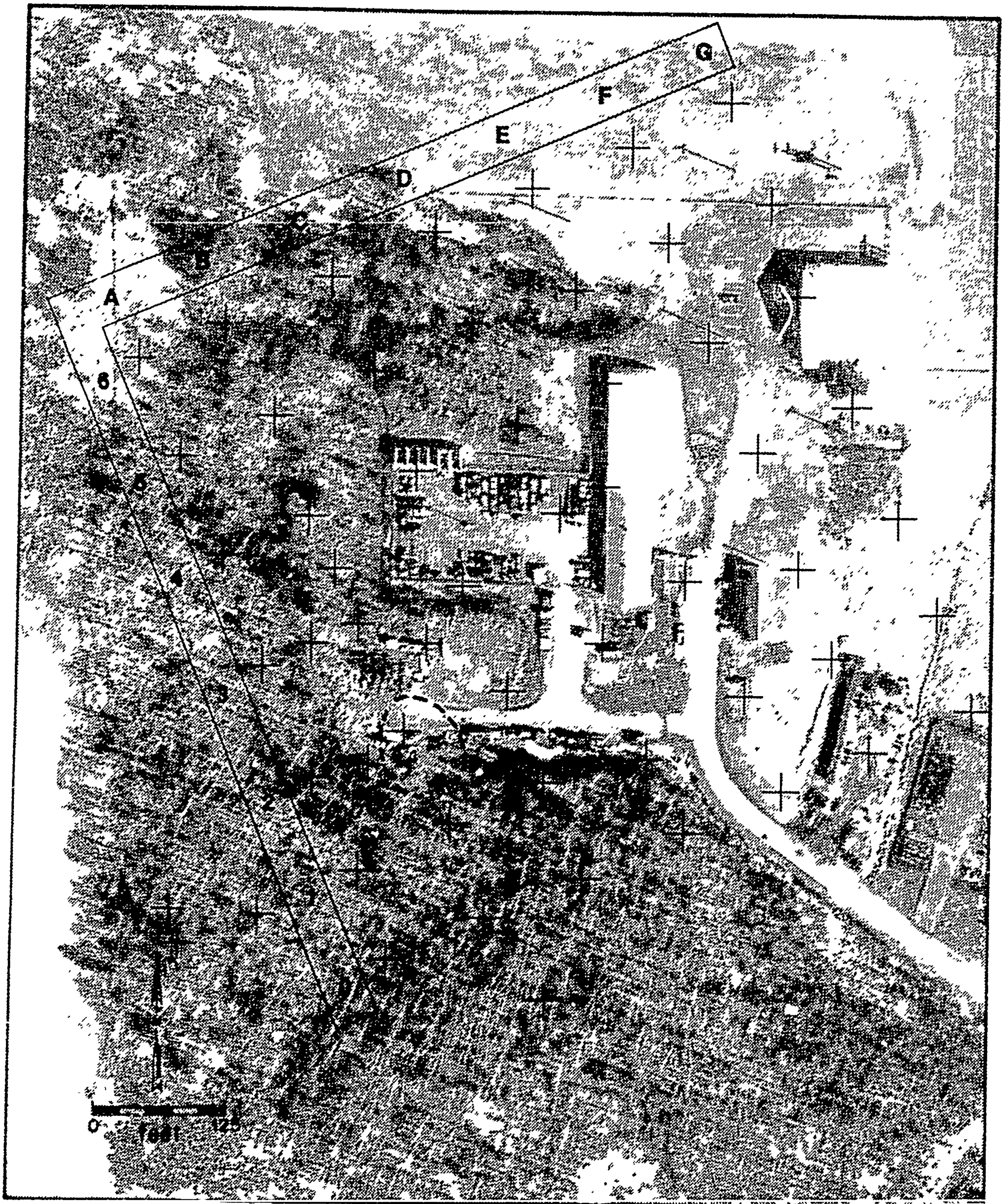


EXPLANATION

6.4 + Probe point with concentration in ppm
Where no concentration is shown, compound was not detected.

Contour interval = 10x
Contours dashed where inferred

Figure O-4 Concentration of Cis-1,2-Dichloroethene in Soil Gas at Site 3.

TABLE O-1

MINNESOTA AIR NATIONAL GUARD BASE, DULUTH, MINNESOTA

SOIL GAS SURVEY RESULTS
(Results in parts per million unless otherwise noted.)

Sample	Soil Gas (SG) Date	Injection Volume (ul)	Vinyl Chloride 50^a	1,1 DCE 50^a	CIS 1,2 DCE 10^a	Benzene 10^a	Toluene 10^a	0-Xylene 10^a	M-Xylene 10^a	Chloro Benzene 30^a	TCE 5^a	PCE 10^a
SG A-0	7/11/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG A-1	7/11/88	1,000	ND	ND	ND	ND	ND	0.0496	0.0307	0.2040	ND	ND
SG A-2	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG A-2D	7/08/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG A-3	7/11/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG A-4	7/11/88	1,000	ND	ND	ND	ND	ND	0.0272	0.0389	ND	ND	ND
SG A 5	7/11/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG A-6	7/11/88	1,000	ND	ND	ND	ND	ND	ND	0.0337	ND	ND	ND
SG B-0	7/11/88	1,000	ND	ND	ND	ND	ND	0.9084	ND	ND	ND	ND
SG B-1	7/11/88	1,000	ND	ND	ND	ND	ND	ND	0.3310	ND	ND	0.0151
SG B-2-3'	7/07/88	5	ND	ND	ND	0.8092	ND	ND	79.9	ND	14.5	ND
SG B-2-3'D	7/07/88	15	ND	ND	ND	1.4	ND	ND	191.5	ND	16.3	ND
SG B-2-3'D2	7/07/88	200	ND	ND	0.384	0.0524	ND	ND	0.2255	ND	ND	0.0547
SG B-2-3'D3	7/07/88	1,000	ND	ND	1.7	0.0406	ND	ND	0.4532	0.4012	ND	0.2124
SG B-2-5'	7/07/88	1,000	ND	ND	6.4	ND	0.3944	ND	0.0412	ND	ND	ND
SG B-2-6	7/07/88	1,000	ND	ND	0.0293	0.0229	0.4628	ND	0.2024	0.1888	ND	0.0968
SG B-2-8'	7/07/88	1,000	ND	ND	0.1895	ND	0.9866	ND	0.1121	ND	ND	ND
SG B-3	7/08/88	2,000	ND	ND	ND	0.3458	ND	ND	ND	0.0737	ND	ND
SG B-3D	7/08/88	1,000	ND	ND	ND	0.5544	ND	ND	ND	0.0801	ND	ND
SG B-4	7/08/88	2,000	ND	ND	ND	0.0327	ND	0.0396	ND	ND	ND	ND
SG B-4D	7/08/88	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG B-5	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG B-5D	7/08/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG B6	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-0	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-0D	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-1	7/11/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-2-3'	7/08/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-2-6'	7/08/88	1,000	ND	ND	ND	ND	ND	ND	0.0109	ND	ND	ND

Sample	Soil Gas (SG) Date	Injection Volume (ul)	Vinyl Chloride 50[a]	1,1 DCE 50[a]	CIS 1,2 DCE 10[a]	Benzene 10[a]	Toluene 19[a]	0-Xylene 10[a]	M-Xylene 10[a]	Chloro Benzene 30[a]	TCE 5[a]	PCE 10[a]
SG F-4	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-4D	7/08/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-5	7/09/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-5D	7/09/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-6	7/13/88	1,000	ND	ND	ND	ND	ND	ND	0.0166	ND	ND	ND
SG G-0	7/10/83	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-1	7/10/83	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-2	7/09/83	2,000	ND	ND	ND	0.0290	0.0373	ND	0.0159	ND	ND	ND
SG G-3	7/09/83	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-4	7/09/83	2,000	ND	ND	ND	ND	ND	ND	ND	0.0358	ND	ND
SG G-4D	7/09/83	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-5	7/09/83	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-5D	7/09/83	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-6	7/13/83	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG G-6D	7/13/83	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG 49	7/12/83	500	ND	ND	ND	ND	ND	ND	0.3177	0.0758	ND	0.0754
SG 53	7/13/83	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG 54	7/13/83	1,000	ND	ND	ND	ND	ND	0.1165	ND	ND	ND	ND
SG 55	7/13/83	1,000	ND	ND	ND	ND	ND	0.1401	ND	ND	ND	ND
SG 56	7/13/83	1,000	ND	ND	ND	ND	ND	0.0123	0.0104	0.6830	ND	ND
SG 57	7/13/83	1,000	ND	ND	ND	ND	1.8	0.0136	ND	0.0493	ND	ND
SG 57D	7/13/83	1,000	ND	ND	ND	ND	1.2	0.0435	0.0183	0.5450	ND	ND
SG 58	7/13/88	1,000	ND	ND	ND	ND	ND	0.0115	ND	ND	ND	ND
SG 59	7/13/83	1,000	ND	ND	ND	ND	ND	0.1977	ND	ND	ND	ND

'ND - Not Detected.
"D" indicates duplicate sample.
[a]Detection limit in ppb.

TABLE O-1 (Continued)

Sample	Soil Gas (SG) Date	Injection Volume (ul)	Vinyl Chloride 50[a]	1,1 DCE 50[a]	CIS 1,2 DCE 10[a]	Benzene 10[a]	Toluene 10[a]	0-Xylene 10[a]	M-Xylene 10[a]	Chloro Benzene 30[a]	TCE 5[a]	PCE 10[a]
SG C-6'D	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-3	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-4	7/12/88	1,000	ND	ND	ND	ND	0.0717	0.5448	ND	0.2576	ND	ND
SG C-4D	7/12/88	1,000	ND	ND	ND	ND	0.0529	1.2	ND	0.1654	0.0153	ND
SG C-5	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG C-6	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG D-0	7/10/88	2,000	ND	ND	ND	ND	ND	ND	0.0119	ND	ND	ND
SG D-1	7/11/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG D-2	7/08/88	2,000	ND	ND	ND	ND	ND	ND	ND	0.0336	0.5073	ND
SG D-2D	7/08/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	0.1968	ND
SG D-3	7/08/88	2,000	ND	ND	ND	ND	0.0972	ND	ND	0.2475	ND	ND
SG D-3D	7/08/88	200	ND	ND	ND	ND	0.0884	0.0314	ND	ND	0.0087	ND
SG D-4	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG D-5	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG D-6	7/09/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG D-6D	7/09/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-0	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	0.1555	ND
SG E-0A	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-0B	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-1	7/11/88	1,000	ND	ND	ND	ND	ND	ND	0.0111	ND	ND	ND
SG E-2	7/09/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-3	7/12/88	1,000	ND	ND	ND	ND	ND	0.0137	ND	ND	ND	ND
SG E-4	7/12/88	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E5	7/09/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-5D	7/09/88	1,000	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG E-6	7/13/88	1,000	ND	ND	ND	ND	ND	ND	0.0424	ND	ND	ND
SG F-0	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-0D	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-1	7/10/88	2,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SG F-2	7/09/88	2,000	ND	ND	ND	ND	0.0102	ND	ND	ND	ND	ND
SG F-3	7/09/88	2,000	ND	ND	ND	ND	0.0111	ND	ND	ND	ND	ND

O.4.4 TETRACHLOROETHENE (PCE)

A PCE anomaly was centered around point DANGB-3-SGB2 as shown in Figure O-5. Detected concentrations ranged from 0.015 to 0.21 ppm.

O.4.5 TOLUENE

Toluene was detected in three anomalies at Site 3 as shown in Figure O-6. The highest concentrations (0.93-1.5 ppm) were centered on point DANGB-3-SGB2. A second anomaly (0.06-0.09 ppm) was detected under the asphalt storage yard, and a third anomaly (0.01-0.04 ppm) was detected at the midpoint of the eastern boundary of the study grid.

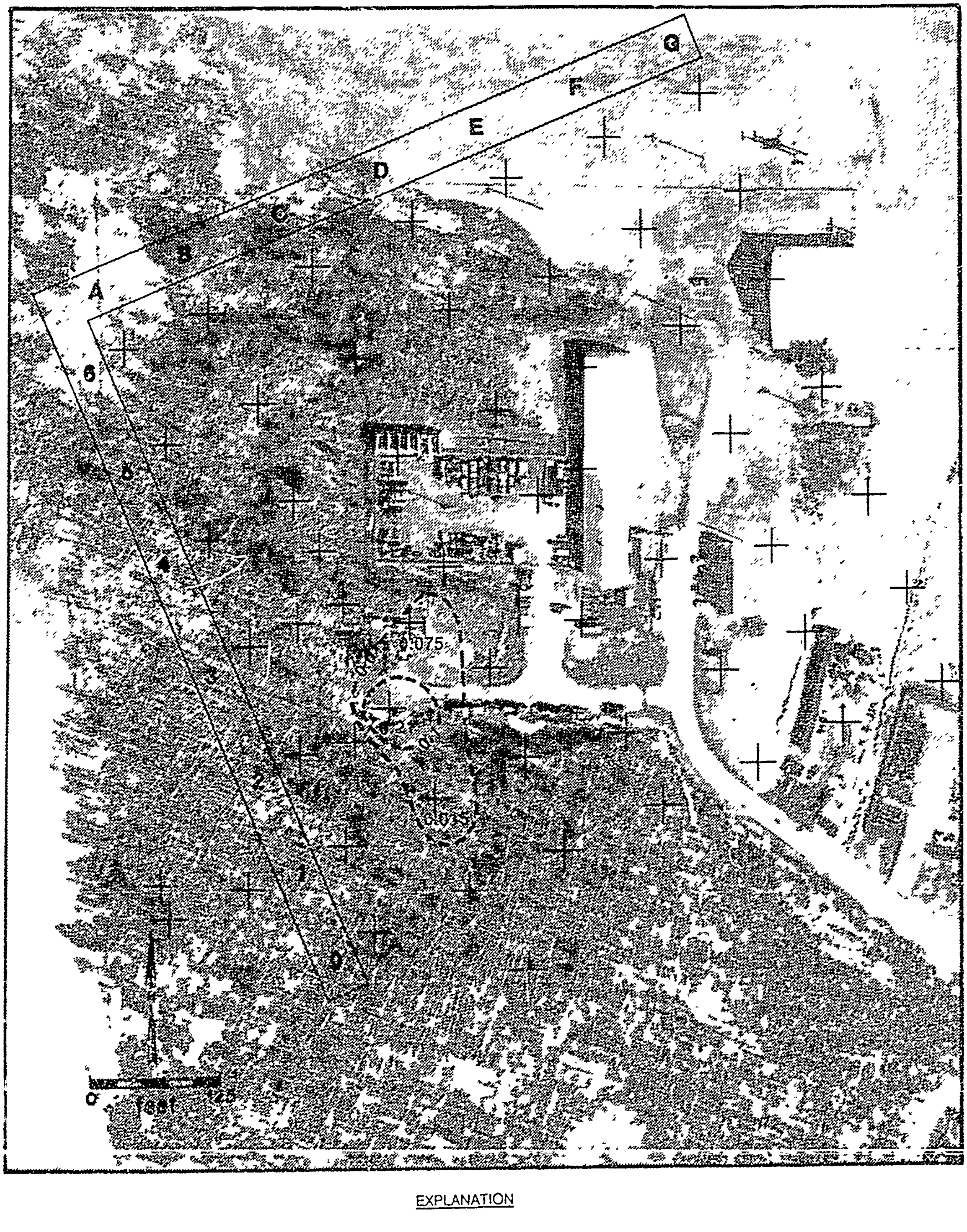
O.4.6 TRICHLOROETHENE (TCE)

Four TCE anomalies were detected at Site 3 during this investigation (Figure O-7). The highest concentration TCE (16.3 ppm) was detected at point DANGB-3-SGB2. A second anomaly, centered on point DANGB-3-SGD2, had a maximum concentration of 0.5 ppm in the soil gas. The third anomaly centered on point DANGB-3-SGE0, had a maximum concentration of 0.16 in the soil gas.

At point DANGB-3-SGB2, four duplicate samples were run from the 3-foot depth along with samples from 5, 6, and 8 foot depths. Two of the analyses from the 3 foot interval gave high concentrations (14-16 ppm). In contrast, TCE was not detected in the rest of the samples from DANGB-3-SGB2.

O.4.7 XYLENE

Xylene is the most widespread contaminant at Site 3 based on the soil gas survey. Concentrations presented in Figure O-8 represent the highest concentration of either o-xylene or m-xylene detected at a particular sampling point. The highest concentration, 191 ppm, was found at point DANGB-3-SGB2. The 191 and 80 ppm values at point DANGB-3-SGB2 represent the highest detected concentration of four samples taken from the 3 foot depth interval while the other two samples had only 0.22-0.45 ppm. The xylene concentrations in the 5,. 6, and 8 foot samples at DANGB-3-SGB2 were 0.04 to 0.20 ppm.



EXPLANATION

0.21 + Probe point with concentration in ppm
Where no concentration is shown, compound was not detected

Contour interval = 10x
Contours dashed where inferred

Figure O-5 Concentration of Tetrachloroethene in Soil Gas at Site 3.

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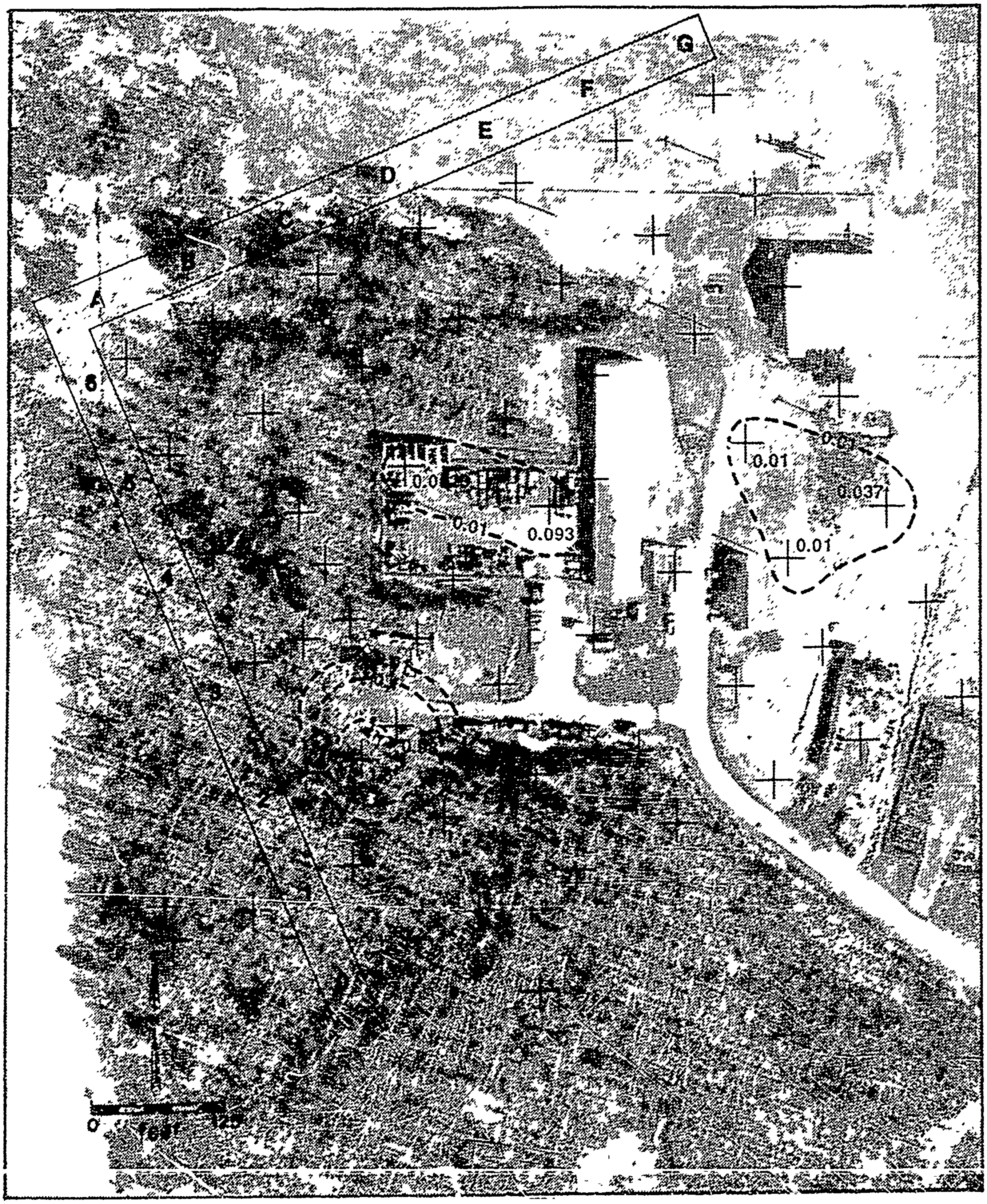

EXPLANATION

0 093 Probe point with concentration in ppm. Where no concentration is shown, compound was not detected

Contour interval = 10x
Contours dashed where inferred

Figure O-6 Concentration of Toluene in Soil Gas at Site 3.

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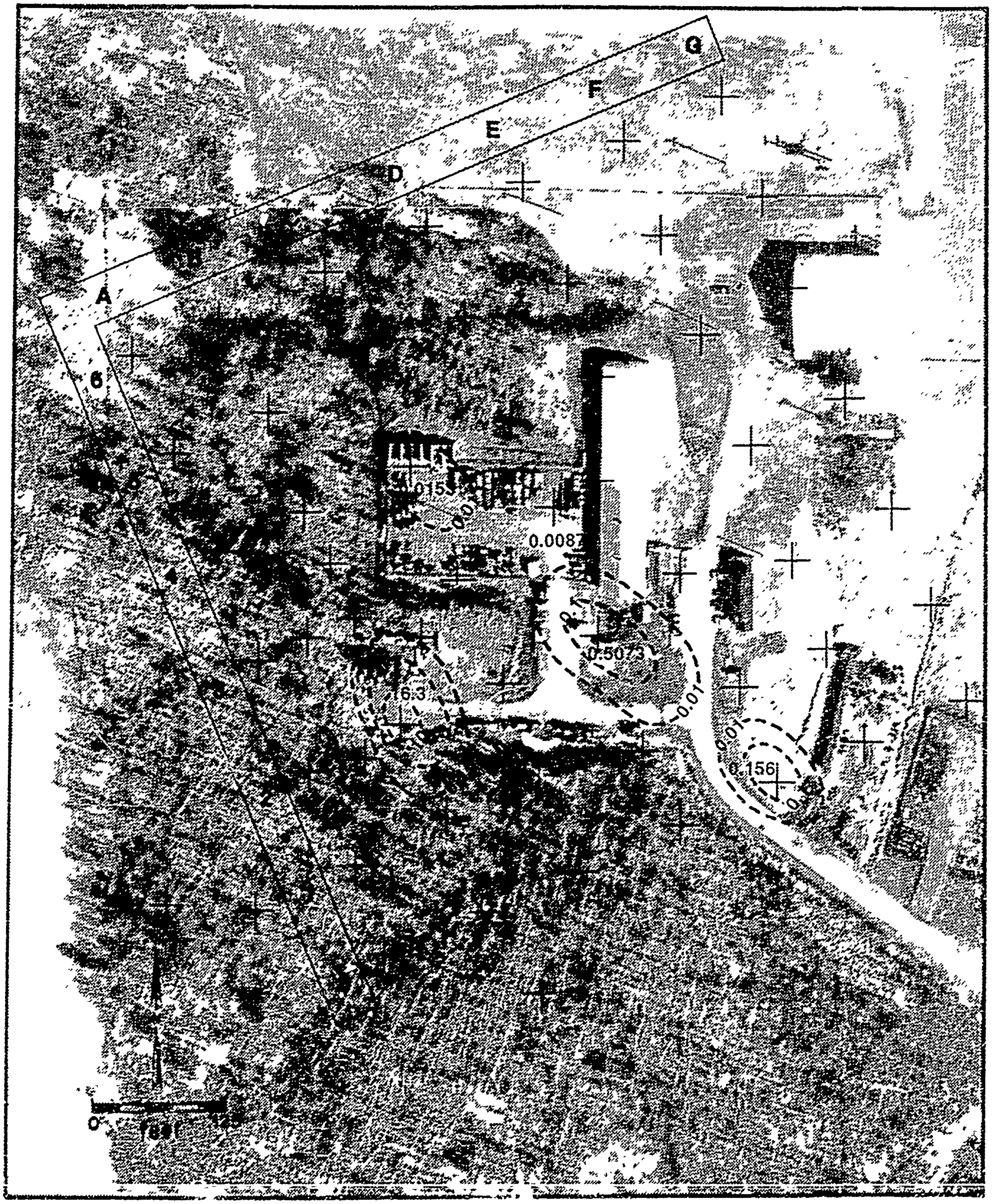
ENGINEERING-SCIENCE, INC.



EXPLANATION

0 5073 ┼ Probe point with concentration in ppm
Where no concentration is shown, compound was not detected.

Contour interval = 10x
Contours dashed where inferred

Figure O-7 Concentration of Trichloroethene in Soil Gas at Site 3.

ES
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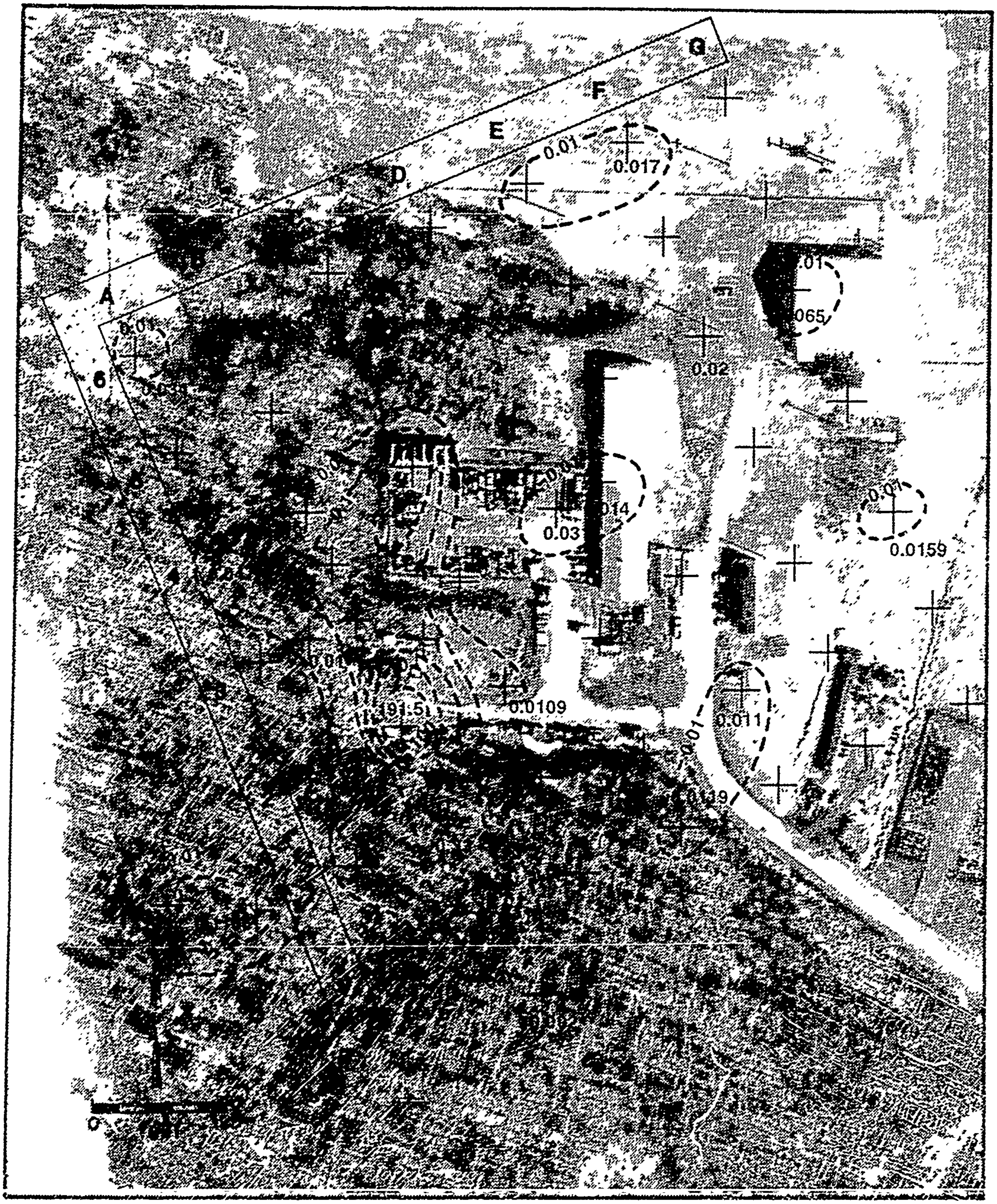

EXPLANATION

0.031 + Probe point with concentration in ppm
Where no concentration is shown, compound was not detected.

Contour interval = 10x
Contours dashed where inferred

Figure O-8 Concentration of Xylene in Soil Gas at Site 3.

SECTION O.5

DISCUSSION OF ANALYTICAL RESULTS

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SECTION O.5
DISCUSSION OF ANALYTICAL RESULTS

Waste petroleum oils and lubricants, waste solvents, and chemicals were stored at Site 3 from 1965 to 1980. Minor drum leaks are known to have occurred in the past, although no major spills were recorded. The primary area of contamination appears to be centered around point DANGB-3-SGB2 located within Storage Area C.

Several compounds were detected in this anomaly including benzene, chlorobenzene, cis-1,2-dichloroethene, tetrachloroethene, toluene, trichloroethene, and xylene. However, the concentrations of benzene, trichloroethene, and xylene at point DANGB-3-SGB2 are uncertain since widely differing analytical results (16.3 ppm to undetected for trichloroethene; 191 to 0.04 ppm for xylene; 1.4 to 0.04 ppm for benzene) were obtained from four samples collected at a depth of 3 feet. The actual concentrations at DANGB-3-SGB2 for benzene, trichloroethene, and xylene are probably the lower values reported for the 3-foot depth samples since a larger injection size (1,000 vs. 5 uL) was used to determine those results. A larger injection size lowers the detection limit and lessens the chance of ambient air and contaminated syringes affecting the results. In addition, the lower values for benzene, toluene, and trichloroethene are supported by chemical results from this study and previously published soil and ground water analyses (Dames & Moore, 1987).

Other minor anomalies were detected elsewhere on the site, as depicted in Figures O-2 through O-8. The anomaly under the existing storage yard, near point DANGB-3-SGC2, was suspected by the field team to be representative of surface contamination. The minor hydrocarbon anomalies probably reflect relatively small surface spills throughout the area since the total amount of volatile hydrocarbons present at the anomalies shown on Figures O-2, O-6, and O-8 is low.

The glacial till with locally occurring clay layers and perched water tables can mask soil gas anomalies. Consequently, soil gas results, which indicate only minor localized contamination, may be distorted by geologic conditions. However, the tetrachlorethene anomaly centered near point DANGB-3-SGB2 defines the source area of ground-water contamination

determined by Dames & Moore (1987). Consequently, the soil gas data can be interpreted to be representative of source areas of chlorinated solvent contamination present at the site. Localized trichloroethene soil gas anomalies shown on Figure O-7 may represent separate point sources of contamination.

APPENDIX P

RISK ASSESSMENT TABLES

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SECTION P.1
INTRODUCTION

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SECTION P.1
INTRODUCTION

Backup data used to perform the risk assessment in Section 6 is presented in this Appendix. Sections P.2, P.3, P.4 and P.5 contain the risk assessment worksheets for Sites 2, 3, 4 and 8, respectively.

Each section contains five subsections of Tables. These are:

indicator chemical selection,
estimation of chemical intake for each pathway,
estimation of total chemical intake for each exposure route,
characterization of risk from noncarcinogens, and
characterization of risk from potential carcinogens.

The table headings are described and explained below.

P.1.1 Indicator Chemical Selection

The column headings for the indicator chemical selection are defined as follows:

Parameter:	The chemical of interest.
CAS Number:	Chemical identifier provided by the Chemical Abstracts Service.
Maximum Value:	The maximum concentration of a chemical that was detected by the referenced studies for a particular site.
Representative Value:	The average concentration of a chemical that was detected by the referenced studies for a particular site; determined by taking the arithmetic mean of the values from samples in which the compound was detected above the Method Detection Limit or the reporting limit.
# Detected/# Analyzed:	The number of samples in which the compound was detected, compared to the total number of samples which were subjected to analysis for the compound. These numbers include duplicates.
Toxicologic Class:	This class indicates whether a compound has been identified as a potential carcinogen (PC) or noncarcinogen (NC).

Severity Rating: A pseudo-quantitative indication of the noncarcinogenic health effects associated with a given compound. Table 6.1 presents the severity rating categories and their associated health effects.

Carcinogen Assessment Group (CAG): A classification which indicates the amount of evidence for carcinogenicity of a compound. Table 6.2 presents the rationale used to assign CAGs.

Toxicity Constant: A potency factor provided by USEPA based on either carcinogenic or noncarcinogenic endpoints for soil, water and air. Toxicity constants for air were not included since no air sampling data was collected during the studies referenced for each site.

CT Value: A value calculated by multiplying the toxicity constant by the maximum or representative concentration for a particular compound.

Indicator Score (IS): The sum of the CT values of all media for a particular chemical. The IS is evaluated separately for maximum and representative concentrations, and only the higher CT value is used in the IS calculation for surface water and ground water.

P.1.2 Estimation of Chemical Intake for Each Pathway

The column headings for pathway specific chemical intake estimation are defined as follows:

Indicator Chemical: A group of 10 to 15 compounds used to represent the overall potential risk to human health from a given site. These indicator chemicals are selected after evaluating the indicator score, toxicological class, chemical properties, availability of toxicological data and frequency of detection of each detected compound.

Fraction Absorbed: The fraction of the indicator chemical's concentration which would be absorbed via a specific pathway, as suggested by previous research.

Human Intake Factor: A factor which is multiplied by the exposure point concentration for an indicator chemical in order to

obtain the chronic daily intake by a human receptor. This factor is determined by assuming values such as the length of time a potential receptor spends at the exposure point, the skin area of the receptor, the body weight of the receptor, the ingestion rate, or the inhalation rate.

Chronic Daily Intake: The daily chemical intake of an indicator chemical by humans, in units of milligram of contaminant per kg body weight per day.

Upper Bound: The chronic daily intake calculated from the maximum indicator chemical concentrations.

Best Estimate: The chronic daily intake calculated from the representative chemical concentrations.

Emission Rate: The rate which an indicator chemical is emitted from a source such as soil or water, in units of milligram of contaminant per unit time.

Exposure Point Concentration: The concentration of the indicator chemical at the human exposure point, in units of milligram of contaminant per unit volume.

Permeability Constant: The rate at which an indicator chemical penetrates the skin, in units of centimeter per hour. This value is not available for most compounds, and is based on previous research.

Exposed Skin Area: The surface area of a human receptors's skin which is available for potential absorption of an indicator chemical, in centimeters squared.

P.1.3 Estimation of Total Chemical Intake for Each Exposure Route

The chronic daily intake values calculated previously are summed for each exposure route in these worksheets. The column headings for route specific chemical intake estimation are therefore self explanatory. Total chronic daily intake is formally defined as follows:

> The summation of chronic daily intakes for a specific route and human population. Exposure routes can be through ingestion, dermal contact or inhalation of an indicator chemical, and potential populations are adult onsite workers, adult nearby residents and

child nearby residents. Total chronic daily intake is calculated for current exposure or future exposure.

P.1.4 Characterization of Risk from Noncarcinogens

Column headings used in worksheets which characterize risk from indicator chemicals which are classified as noncarcinogens are defined as follows:

AIC: Acceptable Chronic Intake, a compound specific value provided by the USEPA, in units of milligrams of contaminant per kilogram body weight per day. The AIC for a compound is ideally based on a chronic study where the test animal or human population was exposed to the compound over a major portion of the subject's lifespan.

CDI:AIC The chronic hazard index for a noncarcinogenic indicator chemical, calculated by dividing the chronic daily intake by the acceptable chronic intake for the indicator chemical. This value has no dimensions, and is calculated separately for oral and inhalation pathways of exposure for each potentially exposed population.

P.1.5 Characterization of Risk from Potential Carcinogens

Column headings used in worksheets which characterize risk from indicator chemicals which are classified as potential carcinogens are defined as follows:

Potency Factor: A compound specific value derived only for compounds which have been shown to cause an increased incidence of tumors in either human or animal studies, in units of inverse {milligrams of contaminant per kilogram body weight per day}. The potency factor is an upper 95 percent confidence limit on lifetime risk and is determined by low dose exptrapolation modeling of animal or human data. Potency factors in this risk assessment were provided by USEPA.

Route-Specific Risk: The probability that a human receptor will contract cancer as a direct result of being exposed to an indicator chemical, calculated by multiplying the chronic daily intake by the compound specific potency factor.

This value has no dimensions, and is calculated separately for oral and inhalation pathways of exposure for each potentially exposed population.

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SECTION P.2

SITE 2 RISK ASSESSMENT TABLES

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SECTION P.2
SITE 2 RISK ASSESSMENT TABLES

This section contains the risk assessment worksheets for Site 2.

P.2.1 Site 2 Indicator Chemical Selection

Data used in the selection of indicator chemicals were compiled from both the Remedial Investigation performed at the Base by ES in 1988 and the 1986 study (Dames & Moore, 1987). These data are summarized in Table P-1, while Tables P-2 through P-5 step through the USEPA selection process.

P.2.2 Site 2 Estimation of Chemical Intake for Each Pathway

Tables P-6 through P-14 summarize the upper bound and best estimate chronic daily intakes from each potential pathway for each population at risk, as calculated from the maximum and average indicator chemical concentrations, respectively.

P.2.3 Site 2 Estimation of Total Chemical Intake for Each Exposure Route

Chronic daily intakes for pathways categorized as oral or inhalation routes are summed to yield total chronic daily intake via a particular route for a target population. Tables P-15 through P-19 present the total chemical intake for each exposure route.

P.2.4 Site 2 Characterization of Risk From Noncarcinogens

Tables P-20 through P-27 present the chronic hazard index values for each target population.

P.2.5 Site 2 Characterization of Risk From Potential Carcinogens

Tables P-28 through P-35 present the risk from potential carcinogens for each target population.

TABLE P-1

MAXIMUM AND REPRESENTATIVE CHEMICAL CONCENTRATIONS AT SITE 2

Parameter	CAS (a) Number	Ground Water (mg/L)			Surface Water (mg/L)			Sediment (mg/kg)			Soils at 0 to 2 Feet (mg/kg)			Soils Below 2 Feet (mg/kg)		
		Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed
Arsenic	7440-38-2	ND (b)	ND	0/0	ND	ND	0/0	1.30E+00	1.02E+00	3/3	3.70E+00	2.70E+00	2/2	2.70E+00	1.66E+00	7/7
Barium	7440-39-3	ND	ND	0/18	ND	ND	0/3	5.39E+01	5.03E+01	3/3	2.95E+02	8.72E+01	11/11	2.62E+02	5.69E+01	29/29
Benzene	71-43-2	1.20E-03	6.00E-04	1/23	ND	ND	0/3	ND	ND	0/6	2.50E+00	1.24E+00	3/12	3.10E+00	1.34E+00	8/37
Cadmium	7740-43-9	ND	ND	0/18	ND	ND	0/3	ND	ND	0/3	1.33E+01	9.02E+00	11/11	1.22E+01	7.58E+00	29/29
Chlorobenzene	108-90-7	ND	ND	0/18	ND	ND	0/3	ND	ND	0/3	8.00E-02	4.50E-02	1/11	ND	ND	0/28
Chromium	7440-47-3	ND	ND	0/18	ND	ND	0/3	2.19E+01	2.03E+01	3/3	3.79E+01	3.16E+01	9/9	3.46E+01	2.54E+01	22/22
Dibutyl Phthalate	84-74-2	ND	ND	0/14	ND	ND	0/1	ND	ND	0/2	ND	ND	0/11	2.00E+00	1.65E+00	3/25
1,2 Dichlorobenzene	95-50-1	ND	ND	0/14	ND	ND	0/1	ND	ND	0/2	ND	ND	0/11	2.00E+00	1.65E+00	3/25
1,2 Dichloroethane	107-06-2	2.20E-04	1.10E-04	1/23	ND	ND	0/3	ND	ND	0/3	1.80E-03	9.00E-04	1/11	ND	ND	0/28
1,1 Dichloroethylene	75-35-4	6.10E-04	3.05E-04	1/23	ND	ND	0/3	ND	ND	0/6	ND	ND	0/11	ND	ND	0/37
Trans-1,2 Dichloroethylene	540-59-0	1.20E+00	2.31E-01	7/23	2.60E-03	1.30E-03	1/4	ND	ND	0/6	9.00E-02	4.50E-02	1/11	8.00E-04	4.00E-04	1/28
Diethyl Phthalate	84-66-2	1.44E-01	1.21E-02	2/14	ND	ND	0/1	ND	ND	0/2	ND	ND	0/8	ND	ND	0/25
Ethyl Benzene	100-41-4	ND	ND	0/18	ND	ND	0/3	ND	ND	0/3	5.20E+00	3.33E+00	3/12	2.50E+01	8.81E+00	8/37
Lead	7439-92-1	ND	ND	0/16	ND	ND	0/3	5.26E+00	6.70E+00	3/3	5.40E+01	1.32E+01	11/11	1.02E+02	8.01E+00	29/29
Mercury	7439-97-6	ND	ND	0/18	ND	ND	0/0	ND	ND	0/3	2.00E-01	1.00E-01	1/2	1.00E-01	5.00E-02	1/7
Pyrene	129-00-0	ND	ND	0/14	ND	ND	0/1	ND	ND	0/2	3.70E+00	1.85E+00	1/8	6.20E-01	3.10E-01	1/25
1,1,2,2 Tetrachloroethane	79-34-5	ND	ND	0/18	ND	ND	0/3	ND	ND	0/3	ND	ND	0/10	1.70E-02	8.50E-03	1/28
Tetrachloroethylene	127-18-4	4.30E-04	2.15E-04	1/23	ND	ND	0/3	ND	ND	0/3	2.30E+00	1.15E+00	2/11	1.50E-01	2.54E-02	6/36
Toluene	108-88-3	ND	ND	0/18	ND	ND	0/3	2.50E-02	1.25E-02	1/6	3.60E+01	3.23E+00	12/12	1.50E+01	9.89E-01	28/37
1,1,1 Trichloroethane	71-55-6	ND	ND	0/18	ND	ND	0/3	2.40E-01	4.58E-02	6/9	ND	ND	0/11	ND	ND	0/37
Trichloroethylene	79-01-6	3.30E-02	1.73E-02	4/23	ND	ND	0/3	2.60E-04	1.30E-04	1/6	1.60E+00	8.01E-01	2/11	7.10E-02	2.94E-02	6/36
Vinyl Chloride	75-01-4	3.10E-03	1.55E-03	1/23	ND	ND	0/3	ND	ND	0/3	ND	ND	0/11	ND	ND	0/28
Xylenes	1330-20-7	ND	ND	0/23	ND	ND	0/3	ND	ND	0/3	1.80E+02	6.86E+01	3/12	7.10E+01	2.13E+01	7/37

a. CAS = Chemical Abstract : Service
b. ND = Not Detected

Source: Engineering-Science, Inc. (1988) and Dames & Moore (1987)

TABLE P-2

TOXICITY DATA FOR COMPOUNDS DETECTED AT SITE 2

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
							Water	Soil	Water	Soil
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	(wT) (e) (L/mg)	(sT) (f) (kg/mg)	(wT) (L/mg)	(sT) (kg/mg)
Arsenic	7440-38-2	NC, PC (g)	9	9	A	A	1.80E+01	9.00E-04	4.07E+00	2.03E-04
Barium	7440-39-3	NC	10	10	D	D	4.08E+00	2.04E-04	- (h)	-
Benzene	71-43-2	NC, PC	5	10	A	A	1.17E-01	5.85E-06	7.71E-03	3.86E-07
Cadmium	7740-43-9	NC, PC	-	8	-	A	NA (i)	NA	NA	NA
Chlorobenzene	108-90-7	NC	4	1	D	D	1.43E-01	7.14E-06	-	-
Chromium	7440-47-3	NC, PC	-	8	-	A	NA	NA	NA	NA
Dibutyl Phthalate	84-74-2	NC	8	8	D	D	3.81E-02	1.90E-06	-	-
1,2 Dichlorobenzene	95-50-1	NC	4	5	D	D	5.19E-02	2.60E-06	-	-
1,2 Dichloroethane	107-06-2	NC, PC	10	8	B2	B2	1.76E-02	8.80E-07	5.86E-02	2.93E-06
1,1 Dichloroethylene	75-35-4	NC, PC	7	5	C	C	3.71E-01	1.86E-05	1.23E-01	6.14E-06
Trans-1,2 Dichloroethylene	540-59-0	NC	5	5	D	D	5.29E-02	2.65E-06	-	-
Diethyl Phthalate	84-66-2	NC	4	4	D	D	2.67E-04	1.34E-08	-	-
Ethyl Benzene	100-41-4	NC	4	4	D	D	1.10E-02	5.52E-07	-	-
Lead	7439-92-1	NC, PC	10	10	B2	B2	8.93E-01	4.46E-05	NA	NA
Mercury	7439-97-6	NC	7	8	D	D	1.84E+01	9.21E-04	-	-
Pyrene	129-00-0	NC, PC	-	-	-	-	NA	NA	NA	NA
1,1,2,2 Tetrachloroethane	79-34-5	NC, PC	5	5	C	C	4.55E-01	2.27E-05	4.74E-02	2.37E-06
Tetrachloroethylene	127-18-4	NC, PC	7	10	B2	B2	9.62E-03	4.81E-07	8.86E-03	4.43E-07
Toluene	108-88-3	NC	7	10	D	D	5.20E-03	2.60E-07	NA	NA
1,1,1 Trichloroethane	71-55-6	NC	2	2	D	D	7.33E-04	3.67E-08	-	-

TABLE P-2 (CONTINUED)

TOXICITY DATA FOR COMPOUNDS DETECTED AT SITE 2

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	Water (wT) (e) (L/mg)	Soil (sT) (f) (kg/mg)	Water (wT) (L/mg)	Soil (sT) (kg/mg)
Trichloroethylene	79-01-6	NC, PC	5	4	B2	B2	1.05E+00	5.26E-05	4.29E-03	2.14E-07
Vinyl Chloride	75-01-4	NC, PC	10	10	A	A	8.77E-02	4.39E-06	4.29E-03	2.14E-07
Xylenes	1330-20-7	NC	8	8	D	D	1.07E-01	5.33E-06	-	-

a. CAS = Chemical Abstracts Service
b. Rating Value = RVe = USEPA health effect rating value for noncarinogens
c. Carcinogen Assessment Group = CAG = USEPA classification of carcinogenicity
d. Toxicity Constant = USEPA potency factor based on either carcinogenic or noncarcinogenic endpoints for a given medium
e. wT = Water toxicity constant
f. sT = Soil toxicity constant
g. NC = Noncarcinogenic effects PC = Potential Carcinogen
h. Not applicable to parameter
i. NA = No data available

Source: U.S. Environmental Protection Agency (1986a)

TABLE P-3

CT VALUES FOR NONCARCINOGENIC COMPOUNDS DETECTED AT SITE 2

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Arsenic	7440-38-2	0.00E+00	0.00E+00	0.00E+00	0 00E+00	1.17E-06	9.18E-07	3.33E-06	2.43E-06	2.43E-05	1.49E-06
Barium	7440-39-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-05	1.03E-05	6.02E-05	1.78E-05	5.34E-05	1.16E-05
Benzene	71-43-2	1.40E-04	7.02E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-05	7.24E-06	1.81E-05	7.83E-06
Cadmium	7740-43-9	- (c)	-	-	-	-	-	-	-	-	-
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-07	3.21E-07	0.00E+00	0.00E+00
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
Dibutyl Phthalate	84-74-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.80E-06	3.13E-06
1,2 Dichlorobenzene	95-50-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.20E-06	4.28E-06
1,2 Dichloroethane	107-06-2	3.87E-06	1.94E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-09	7.92E-10	0.00E+00	0.00E+00
1,1 Dichloroethylene	75-35-4	2.26E-04	1.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	540-59-0	6.35E-02	1.22E-02	1.38E-04	6.88E-05	0.00E+00	0.00E+00	2.38E-07	1.19E-07	2.12E-09	1.06E-09
Diethyl Phthalate	84-66-2	3.84E-05	3.24E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.87E-06	1.84E-06	1.38E-05	4.87E-06
Lead	7439-92-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.99E-07	4.55E-08	2.41E-06	5.89E-07	4.46E-06	3.57E-07
Mercury	7439-97-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.84E-07	9.21E-08	9.21E-08	4.61E-08
Pyrene	129-00-0	-	-	-	-	-	-	-	-	-	-
1,1,2,2 Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.86E-07	1.93E-07
Tetrachloroethylene	127-18-4	4.14E-06	2.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-06	5.54E-07	7.27E-08	1.22E-08
Toluene	108-88-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.50E-09	3.25E-09	9.36E-06	8.39E-07	3.90E-06	2.57E-07
1,1,1 Trichloroethane	71-55-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.81E-09	1.68E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	3.47E-02	1.82E-02	0.00E+00	0.00E+00	1.37E-08	6.84E-09	4.94E-05	8.42E-05	0.00E+00	1.54E-06
Vinyl Chloride	75-01-4	2.72E-04	1.36E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00F+00	0.00E+00	0.00E+00	9.59E-04	3.66E-04	3.78E-04	1.13E-04

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-4

CT VALUES FOR POTENTIALLY CARCINOGENIC COMPOUNDS DETECTED AT SITE 2

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils: 0 to 2 Feet		CT Values for Soils: Below 2 Feet	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Arsenic	7440-38-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-07	2.07E-07	7.51E-07	5.48E-07	5.48E-07	3.36E-07
Barium	7440-39-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	71-43-2	9.25E-06	4.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.65E-07	4.78E-07	1.20E-06	5.16E-07
Cadmium	7740-43-9	- (c)	-	-	-	-	-	-	-	-	-
Chlorobenzene	108-90-7	-	-	-	-	-	-	-	-	-	-
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
Dibutyl Phthalate	84-74-2	-	-	-	-	-	-	-	-	-	-
1,2 Dichlorobenzene	95-50-1	-	-	-	-	-	-	-	-	-	-
1,2 Dichloroethane	107-06-2	1.29E-05	6.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.27E-09	2.64E-09	0.00E+00	0.00E+00
1,1 Dichloroethylene	75-35-4	7.50E-05	3.75E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	540-59-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Diethyl Phthalate	84-66-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	7439-92-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	7439-97-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	129-00-0	-	-	-	-	-	-	-	-	-	-
1,1,2,2 Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.03E-08	2.01E-08
Tetrachloroethylene	127-18-4	3.81E-06	1.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E-06	5.11E-07	6.64E-08	1.12E-08
Toluene	108-88-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,1 Trichloroethane	71-55-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	1.42E-04	7.43E-05	0.00E+00	0.00E+00	5.56E-11	2.78E-11	2.01E-07	3.42E-07	0.00E+00	6.28E-09
Vinyl Chloride	75-01-4	1.33E-05	6.65E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-5

INDICATOR SCORES AND TENTATIVE RANKING FOR COMPOUNDS DETECTED AT SITE 2

Parameter	CAS (a) Number	Indicator Score for Noncarcinogenic Effects		Tentative Rank for Noncarcinogenic Effects		Indicator Score for Potential Carcinogens		Tentative Rank for Potential Carcinogens	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Arsenic	7440-38-2	6.93E-03	4.84E-03	5	4	1.56E-03	1.09E-03	1	1
Barium	7440-39-3	1.25E-01	3.97E-02	1	1	0.00E+00	0.00E+00		
Benzene	71-43-2	1.73E-04	8.53E-05	10	10	1.14E-05	5.62E-06	6	6
Cadmium	7740-43-9	0.00E+00	0.00E+00			0.00E+00	0.00E+00		
Chlorobenzene	108-90-7	5.71E-07	3.21E-07	18	18	0.00E+00	0.00E+00		
Chromium	7440-47-3	0.00E+00	0.00E+00			0.00E+00	0.00E+00		
Dibutyl Phthalate	84-74-2	3.80E-06	3 13E-06	17	14	0.00E+00	0.00E+00		
1,2 Dichlorobenzene	95-50-1	5.20E-06	4.28E-06	15	12	0.00E+00	0.00E+00		
1,2 Dichloroethane	107-06-2	3.87E-06	1.94E-06	16	16	1.29E-05	6.45E-06	5	5
1,1 Dichloroethylene	75-35-4	2.26E-04	1.13E-04	9	9	7.50E-05	3.75E-05	3	3
Trans-1,2 Dichloroethylene	540-59-0	6.35E-02	1.22E-02	2	3	0.00E+00	0.00E+00		
Diethyl Phthalate	84-66-2	3.84E-05	3.24E-06	11	13	0.00E+00	0.00E+00		
Ethyl Benzene	100-41-4	1.67E-05	6.70E-06	12	11	0.00E+00	0.00E+00		
Lead	7439-92-1	7.19E-03	1.24E-03	4	5	0.00E+00	0.00E+00		
Mercury	7439-97-6	2.76E-04	1.38E-04	7	7	0.00E+00	0.00E+00		
Pyrene	129-00-0	0.00E+00	0.00E+00			0.00E+00	0.00E+00		
1,1,2,2 Tetrachloroethane	79-34-5	3.86E-07	1.93E-07	19	19	4.03E-08	2.01E-08	8	8
Tetrachloroethylene	127-18-4	5.32E-06	2.63E-06	14	15	4.90E-06	2.43E-06	7	7
Toluene	108-88-3	1.33E-05	1.10E-06	13	17	0.00E+00	0.00E+00		
1,1,1 Trichloroethane	71-55-6	8.81E-09	1.68E-09	20	20	0.00E+00	0.00E+00		
Trichloroethylene	79-01-6	3.47E-02	1.83E-02	3	2	1.42E-04	7.47E-05	2	2
Vinyl Chloride	75-01-4	2.72E-04	1.36E-04	8	8	1.33E-05	6.65E-06	4	4
Xylenes	1330-20-7	1.34E-03	4.79E-04	6	6	0.00E+00	0.00E+00		

a. CAS = Chemical Abstracts Service

TABLE P-6

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF SOIL AT DEPTH
FOR WORKERS AT SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	2.70E+00	1.66E+00	1.00E+00	1.68E-09	4.53E-09	2.78E-09
Barium	2.62E+02	5.69E+01	5.00E-01	8.39E-10	2.20E-07	4.77E-08
Benzene	3.10E+00	1.34E+00	1.00E+00	1.68E-09	5.20E-09	2.24E-09
Dibutyl Phthalate	2.00E+00	1.65E+00	1.00E+00	1.68E-09	3.35E-09	2.76E-09
1,1 Dichloroethylene	ND (b)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	8.00E-04	4.00E-04	1.00E+00	1.68E-09	1.34E-12	6.71E-13
Diethyl Phthalate	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Ethyl Benzene	2.50E+01	8.81E+00	1.00E+00	1.68E-09	4.19E-08	1.48E-08
Lead	1.02E+02	8.01E+00	1.50E-01	2.52E-10	2.57E-08	2.02E-09
Mercury	1.00E-01	5.00E-02	7.00E-02	1.17E-10	1.17E-11	5.87E-12
Tetrachloroethylene	1.50E-01	2.54E-02	1.00E+00	1.68E-09	2.52E-10	4.26E-11
Toluene	1.50E+01	9.89E-01	1.00E+00	1.68E-09	2.52E-08	1.66E-09
Trichloroethylene	7.10E-02	2.94E-02	1.00E+00	1.68E-09	1.19E-10	4.92E-11
Vinyl Chloride	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Xylenes	7.10E+01	2.13E+01	1.00E+00	1.68E-09	1.19E-07	3.57E-08

a. ND = Not Detected

TABLE P-7

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER
FOR ONSITE ADULT RESIDENTS OR WORKERS AT SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (a)	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Barium	ND	ND	5.00E-01	1.43E-02	0.00E+00	0.00E+00
Benzene	1.20E-03	6.00E-04	1.00E+00	2.86E-02	3.43E-05	1.71E-05
Dibutyl Phthalate	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
1,1 Dichloroethylene	6.10E-04	3.05E-04	1.00E+00	2.86E-02	1.74E-05	8.71E-06
Trans-1,2 Dichloroethylene	1.20E+00	2.31E-01	1.00E+00	2.86E-02	3.43E-02	6.60E-03
Diethyl Phthalate	1.44E-01	1.21E-02	1.00E+00	2.86E-02	4.11E-03	3.47E-04
Ethyl Benzene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Lead	ND	ND	1.50E-01	4.29E-03	0.00E+00	0.00E+00
Mercury	ND	ND	7.00E-02	2.00E-03	0.00E+00	0.00E+00
Tetrachloroethylene	4.30E-04	2.15E-04	1.00E+00	2.86E-02	1.23E-05	6.14E-06
Toluene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Trichloroethylene	3.30E-02	1.73E-02	1.00E+00	2.86E-02	9.43E-04	4.95E-04
Vinyl Chloride	3.10E-03	1.55E-03	1.00E+00	2.86E-02	8.86E-05	4.43E-05
Xylenes	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-8

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER
FOR ONSITE CHILD RESIDENTS AT SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (a)	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Barium	ND	ND	5.00E-01	1.07E-02	0.00E+00	0.00E+00
Benzene	1.20E-03	6.00E-04	1.00E+00	2.14E-02	2.57E-05	1.29E-05
Dibutyl Phthalate	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
1,1 Dichloroethylene	6.10E-04	3.05E-04	1.00E+00	2.14E-02	1.31E-05	6.54E-06
Trans-1,2 Dichloroethylene	1.20E+00	2.31E-01	1.00E+00	2.14E-02	2.57E-02	4.95E-03
Diethyl Phthalate	1.44E-01	1.21E-02	1.00E+00	2.14E-02	3.09E-03	2.60E-04
Ethyl Benzene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Lead	ND	ND	4.00E-01	8.57E-03	0.00E+00	0.00E+00
Mercury	ND	ND	7.00E-02	1.50E-03	0.00E+00	0.00E+00
Tetrachloroethylene	4.30E-04	2.15E-04	1.00E+00	2.14E-02	9.21E-06	4.61E-06
Toluene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Trichloroethylene	3.30E-02	1.73E-02	1.00E+00	2.14E-02	7.07E-04	3.71E-04
Vinyl Chloride	3.10E-03	1.55E-03	1.00E+00	2.14E-02	6.64E-05	3.32E-05
Xylenes	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-9

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR WORKERS AT SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	1.00E+00	1.68E-09	6.21E-09	4.53E-09
Barium	2.95E+02	8.72E+01	5.00E-01	8.39E-10	2.47E-07	7.31E-08
Benzene	2.50E+00	1.24E+00	1.00E+00	1.68E-09	4.19E-09	2.08E-09
Dibutyl Phthalate	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.00E+00	1.68E-09	1.51E-10	7.55E-11
Diethyl Phthalate	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	1.00E+00	1.68E-09	8.72E-09	5.58E-09
Lead	5.40E+01	1.32E+01	1.50E-01	2.52E-10	1.36E-08	3.32E-09
Mercury	2.00E-01	1.00E-01	7.00E-02	1.17E-10	2.35E-11	1.17E-11
Tetrachloroethylene	2.30E+00	1.15E+00	1.00E+00	1.68E-09	3.86E-09	1.93E-09
Toluene	3.60E+01	3.23E+00	1.00E+00	1.68E-09	6.04E-08	5.41E-09
Trichloroethylene	1.60E+00	8.01E-01	1.00E+00	1.68E-09	2.68E-09	1.34E-09
Vinyl Chloride	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	1.00E+00	1.68E-09	3.02E-07	1.15E-07

a. ND = Not Detected

TABLE P-10

CURRENT EXPOSURE POINT INTAKE VIA FUGITIVE DUST GENERATION (FDG)
FOR WORKERS AT SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Emission Rate Due to Wind Erosion (mg/hr)		Exposure Point Concentration (mg/m3)		Human Intake Factor (m3/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative	Upper Bound	Best Estimate	Upper Bound	Best Estimate		Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	5.16E-04	3.77E-04	9.02E-11	6.58E-11	1.94E-03	1.75E-13	1.28E-13
Barium	2.95E+02	8.72E+01	4.12E-02	1.22E-02	7.19E-09	2.12E-09	1.94E-03	1.40E-11	4.13E-12
Benzene	2.50E+00	1.24E+00	3.49E-04	1.73E-04	6.09E-11	3.02E-11	1.94E-03	1.18E-13	5.86E-14
Dibutyl Phthalate	ND (a)	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.26E-05	6.28E-06	2.19E-12	1.10E-12	1.94E-03	4.26E-15	2.13E-15
Diethyl Phthalate	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	7.25E-04	4.64E-04	1.27E-10	8.11E-11	1.94E-03	2.46E-13	1.58E-13
Lead	5.40E+01	1.32E+01	7.53E-03	1.84E-03	1.32E-09	3.22E-10	1.94E-03	2.56E-12	6.25E-13
Mercury	2.00E-01	1.00E-01	2.79E-05	1.40E-05	4.87E-12	2.44E-12	1.94E-03	9.47E-15	4.74E-15
Tetrachloroethylene	2.30E+00	1.15E+00	3.21E-04	1.61E-04	5.6[illegible]E-11	2.81E-11	1.94E-03	1.09E-13	5.46E-14
Toluene	3.60E+01	3.23E+00	5.02E-03	4.50E-04	8.77E-10	7.86E-11	1.94E-03	1.71E-12	1.53E-13
Trichloroethylene	1.60E+00	8.01E-01	2.23E-04	1.12E-04	3.90E-11	1.95E-11	1.94E-03	7.58E-14	3.79E-14
Vinyl Chloride	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	2.51E-02	9.58E-03	4.39E-09	1.67E-09	1.94E-03	8.53E-12	3.25E-12

a. ND = Not Detected

TABLE P-11

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR NEARBY ADULTS VISITING SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	1.00E+00	1.68E-09	6.21E-09	4.53E-09
Barium	2.95E+02	8.72E+01	5.00E-01	8.39E-10	2.47E-07	7.31E-08
Benzene	2.50E+00	1.24E+00	1.00E+00	1.68E-09	4.19E-09	2.08E-09
Dibutyl Phthalate	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.00E+00	1.68E-09	1.51E-10	7.55E-11
Diethyl Phthalate	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	1.00E+00	1.68E-09	8.72E-09	5.58E-09
Lead	5.40E+01	1.32E+01	1.50E-01	2.52E-10	1.36E-08	3.32E-09
Mercury	2.00E-01	1.00E-01	7.00E-02	1.17E-10	2.35E-11	1.17E-11
Tetrachloroethylene	2.30E+00	1.15E+00	1.00E+00	1.68E-09	3.86E-09	1.93E-09
Toluene	3.60E+01	3.23E+00	1.00E+00	1.68E-09	6.04E-08	5.41E-09
Trichloroethylene	1.60E+00	8.01E-01	1.00E+00	1.68E-09	2.68E-09	1.34E-09
Vinyl Chloride	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	1.00E+00	1.68E-09	3.02E-07	1.15E-07

a. ND = Not Detected

TABLE P-12

CURRENT EXPOSURE POINT INTAKE VIA FUGITIVE DUST GENERATION (FDG)
FOR NEARBY ADULTS VISITING SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Emission Rate Due to Wind Erosion (mg/hr)		Exposure Point Concentration (mg/m3)		Human Intake Factor (m3/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative	Upper Bound	Best Estimate	Upper Bound	Best Estimate		Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	5.16E-04	3.77E-04	1.88E-11	1.37E-11	1.94E-03	3.65E-14	2.66E-14
Barium	2.95E+02	8.72E+01	4.12E-02	1.22E-02	1.50E-09	4.43E-10	1.94E-03	2.91E-12	8.60E-13
Benzene	2.50E+00	1.24E+00	3.49E-04	1.73E-04	1.27E-11	6.29E-12	1.94E-03	2.47E-14	1.22E-14
Dibutyl Phthalate	ND (a)	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.26E-05	6.28E-06	4.57E-13	2.28E-13	1.94E-03	8.88E-16	4.44E-16
Diethyl Phthalate	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	7.25E-04	4.64E-04	2.64E-11	1.69E-11	1.94E-03	5.13E-14	3.28E-14
Lead	5.40E+01	1.32E+01	7.53E-03	1.84E-03	2.74E-10	6.70E-11	1.94E-03	5.33E-13	1.30E-13
Mercury	2.00E-01	1.00E-01	2.79E-05	1.40E-05	1.02E-12	5.08E-13	1.94E-03	1.97E-15	9.87E-16
Tetrachloroethylene	2.30E+00	1.15E+00	3.21E-04	1.61E-04	1.17E-11	5.85E-12	1.94E-03	2.27E-14	1.14E-14
Toluene	3.60E+01	3.23E+00	5.02E-03	4.50E-04	1.83E-10	1.64E-11	1.94E-03	3.55E-13	3.18E-14
Trichloroethylene	1.60E+00	8.01E-01	2.23E-04	1.12E-04	8.12E-12	4.07E-12	1.94E-03	1.58E-14	7.90E-15
Vinyl Chloride	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	2.51E-02	9.58E-03	9.14E-10	3.48E-10	1.94E-03	1.78E-12	6.77E-13

a. ND = Not Detected

TABLE P-13

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR NEARBY CHILDREN VISITING SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	1.00E+00	1.76E-09	6.52E-09	4.76E-09
Barium	2.95E+02	8.72E+01	5.00E-01	8.81E-10	2.60E-07	7.68E-08
Benzene	2.50E+00	1.24E+00	1.00E+00	1.76E-09	4.40E-09	2.18E-09
Dibutyl Phthalate	ND (a)	ND	1.00E+00	1.76E-09	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	1.00E+00	1.76E-09	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.00E+00	1.76E-09	1.59E-10	7.93E-11
Diethyl Phthalate	ND	ND	1.00E+00	1.76E-09	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	1.00E+00	1.76E-09	9.16E-09	5.86E-09
Lead	5.40E+01	1.32E+01	4.00E-01	7.05E-10	3.80E-08	9.30E-09
Mercury	2.00E-01	1.00E-01	7.00E-02	1.23E-10	2.47E-11	1.23E-11
Tetrachloroethylene	2.30E+00	1.15E+00	1.00E+00	1.76E-09	4.05E-09	2.03E-09
Toluene	3.60E+01	3.23E+00	1.00E+00	1.76E-09	6.34E-08	5.68E-09
Trichloroethylene	1.60E+00	8.01E-01	1.00E+00	1.76E-09	2.82E-09	1.41E-09
Vinyl Chloride	ND	ND	1.00E+00	1.76E-09	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	1.00E+00	1.76E-09	3.17E-07	1.21E-07

a. ND = Not Detected

TABLE P-14

CURRENT EXPOSURE POINT INTAKE VIA FUGITIVE DUST GENERATION (FDG)
FOR NEARBY CHILDREN VISITING SITE 2

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Emission Rate Due to Wind Erosion (mg/hr)		Exposure Point Concentration (mg/m3)		Human Intake Factor (m3/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative	Upper Bound	Best Estimate	Upper Bound	Best Estimate		Upper Bound	Best Estimate
Arsenic	3.70E+00	2.70E+00	5.16E-04	3.77E-04	1.88E-11	1.37E-11	1.28E-03	2.40E-14	1.75E-14
Barium	2.95E+02	8.72E+01	4.12E-02	1.22E-02	1.50E-09	4.43E-10	1.28E-03	1.91E-12	5.65E-13
Benzene	2.50E+00	1.24E+00	3.49E-04	1.73E-04	1.27E-11	6.29E-12	1.28E-03	1.62E-14	8.02E-15
Dibutyl Phthalate	ND (a)	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	0.00E+00
1,1 Dichloroethylene	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	9.00E-02	4.50E-02	1.26E-05	6.28E-06	4.57E-13	2.28E-13	1.28E-03	5.83E-16	2.91E-16
Diethyl Phthalate	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	0.00E+00
Ethyl Benzene	5.20E+00	3.33E+00	7.25E-04	4.64E-04	2.64E-11	1.69E-11	1.28E-03	3.37E-14	2.15E-14
Lead	5.40E+01	1.32E+01	7.53E-03	1.84E-03	2.74E-10	6.70E-11	1.28E-03	3.50E-13	8.55E-14
Mercury	2.00E-01	1.00E-01	2.79E-05	1.40E-05	1.02E-12	5.08E-13	1.28E-03	1.30E-15	6.48E-16
Tetrachloroethylene	2.30E+00	1.15E+00	3.21E-04	1.61E-04	1.17E-11	5.85E-12	1.28E-03	1.49E-14	7.46E-15
Toluene	3.60E+01	3.23E+00	5.02E-03	4.50E-04	1.83E-10	1.64E-11	1.28E-03	2.33E-13	2.09E-14
Trichloroethylene	1.60E+00	8.01E-01	2.23E-04	1.12E-04	8.12E-12	4.07E-12	1.28E-03	1.04E-14	5.19E-15
Vinyl Chloride	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	0.00E+00	0.00E+00
Xylenes	1.80E+02	6.86E+01	2.51E-02	9.58E-03	9.14E-10	3.48E-10	1.28E-03	1.17E-12	4.44E-13

a. ND = Not Detected

TABLE P-15

FUTURE TOTAL CHRONIC INTAKE
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 2

Indicator Chemical	Ingestion of Soil at Depth (mg/kg/day)		Ingestion of Ground Water (mg/kg/day)		Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	4.53E-09	2.78E-09	0.00E+00	0.00E+00	4.53E-09	2.78E-09
Barium	2.20E-07	4.77E-08	0.00E+00	0.00E+00	2.20E-07	4.77E-08
Benzene	5.20E-09	2.24E-09	3.43E-05	1.71E-05	3.43E-05	1.71E-05
Dibutyl Phthalate	3.35E-09	2.76E-09	0.00E+00	0.00E+00	3.35E-09	2.76E-09
1,1 Dichloroethylene	0.00E+00	0.00E+00	1.74E-05	8.71E-06	1.74E-05	8.71E-06
Trans-1,2 Dichloroethylene	1.34E-12	6.71E-13	3.43E-02	6.60E-03	3.43E-02	6.60E-03
Diethyl Phthalate	0.00E+00	0.00E+00	4.11E-03	3.47E-04	4.11E-03	3.47E-04
Ethyl Benzene	4.19E-08	1.48E-08	0.00E+00	0.00E+00	4.19E-08	1.48E-08
Lead	2.57E-08	2.02E-09	0.00E+00	0.00E+00	2.57E-08	2.02E-09
Mercury	1.17E-11	5.87E-12	0.00E+00	0.00E+00	1.17E-11	5.87E-12
Tetrachloroethylene	2.52E-10	4.26E-11	1.23E-05	6.14E-06	1.23E-05	6.14E-06
Toluene	2.52E-08	1.66E-09	0.00E+00	0.00E+00	2.52E-08	1.66E-09
Trichloroethylene	1.19E-10	4.92E-11	9.43E-04	4.95E-04	9.43E-04	4.95E-04
Vinyl Chloride	0.00E+00	0.00E+00	8.86E-05	4.43E-05	8.86E-05	4.43E-05
Xylenes	1.19E-07	3.57E-08	0.00E+00	0.00E+00	1.19E-07	3.57E-08

TABLE P-16

FUTURE TOTAL CHRONIC INTAKE
ONSITE CHILD RESIDENTS AT SITE 2

Indicator Chemical	Total Chronic Daily Intakes Ingestion Route (mg/kg/day) Upper Bound	Best Estimate
Arsenic	0.00E+00	0.00E+00
Barium	0.00E+00	0.00E+00
Benzene	2.57E-05	1.29E-05
Dibutyl Phthalate	0.00E+00	0.00E+00
1,1 Dichloroethylene	1.31E-05	6.54E-06
Trans-1,2 Dichloroethylene	2.57E-02	4.95E-03
Diethyl Phthalate	3.09E-03	2.60E-04
Ethyl Benzene	0.00E+00	0.00E+00
Lead	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00
Tetrachloroethylene	9.21E-06	4.61E-06
Toluene	0.00E+00	0.00E+00
Trichloroethylene	7.07E-04	3.71E-04
Vinyl Chloride	6.64E-05	3.32E-05
Xylenes	0.00E+00	0.00E+00

TABLE P-17

TOTAL CHRONIC INTAKE FOR WORKERS AT SITE 2
CURRENT

Indicator Chemical	Total Chronic Daily Intakes Oral Route (mg/kg/day)		Total Chronic Daily Intakes Inhalation Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	6.21E-09	4.53E-09	1.75E-13	1.28E-13
Barium	2.47E-07	7.31E-08	1.40E-11	4.13E-12
Benzene	4.19E-09	2.08E-09	1.18E-13	5.86E-14
Dibutyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	1.51E-10	7.55E-11	4.26E-15	2.13E-15
Diethyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	8.72E-09	5.58E-09	2.46E-13	1.58E-13
Lead	1.36E-08	3.32E-09	2.56E-12	6.25E-13
Mercury	2.35E-11	1.17E-11	9.47E-15	4.74E-15
Tetrachloroethylene	3.86E-09	1.93E-09	1.09E-13	5.46E-14
Toluene	6.04E-08	5.41E-09	1.71E-12	1.53E-13
Trichloroethylene	2.68E-09	1.34E-09	7.58E-14	3.79E-14
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	3.02E-07	1.15E-07	8.53E-12	3.25E-12

TABLE P-18

TOTAL CHRONIC INTAKE FOR ADULTS NEAR SITE 2
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Inhalation Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	6.21E-09	4.53E-09	3.65E-14	2.66E-14
Barium	2.47E-07	7.31E-08	2.91E-12	8.60E-13
Benzene	4.19E-09	2.08E-09	2.47E-14	1.22E-14
Dibutyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	1.51E-10	7.55E-11	8.88E-16	4.44E-16
Diethyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	8.72E-09	5.58E-09	5.13E-14	3.28E-14
Lead	1.36E-08	3.32E-09	5.33E-13	1.30E-13
Mercury	2.35E-11	1.17E-11	1.97E-15	9.87E-16
Tetrachloroethylene	3.86E-09	1.93E-09	2.27E-14	1.14E-14
Toluene	6.04E-08	5.41E-09	3.55E-13	3.18E-14
Trichloroethylene	2.68E-09	1.34E-09	1.58E-14	7.90E-15
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	3.02E-07	1.15E-07	1.78E-12	6.77E-13

TABLE P-19

TOTAL CHRONIC INTAKE FOR CHILDREN NEAR SITE 2
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Inhalation Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	6.52E-09	4.76E-09	2.40E-14	1.75E-14
Barium	2.60E-07	7.68E-08	1.91E-12	5.65E-13
Benzene	4.40E-09	2.18E-09	1.62E-14	8.02E-15
Dibutyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	1.59E-10	7.93E-11	5.83E-16	2.91E-16
Diethyl Phthalate	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	9.16E-09	5.86E-09	3.37E-14	2.15E-14
Lead	3.80E-08	9.30E-09	3.50E-13	8.55E-14
Mercury	2.47E-11	1.23E-11	1.30E-15	6.48E-16
Tetrachloroethylene	4.05E-09	2.03E-09	1.49E-14	7.46E-15
Toluene	6.34E-08	5.68E-09	2.33E-13	2.09E-14
Trichloroethylene	2.82E-09	1.41E-09	1.04E-14	5.19E-15
Vinyl Chloride	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	3.17E-07	1.21E-07	1.17E-12	4.44E-13

TABLE P-20

CHRONIC HAZARD INDEX
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 2
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	4.53E-09	NA (c)	0.00E+00	2.78E-09	NA	0.00E+00
Barium	2.20E-07	5.10E-02	4.31E-06	4.77E-08	5.10E-02	9.36E-07
Benzene	3.43E-05	NA	0.00E+00	1.71E-05	NA	0.00E+00
Dibutyl Phthalate	3.35E-09	1.00E-01	3.35E-08	2.76E-09	1.00E-01	2.76E-08
1,1 Dichloroethylene	1.74E-05	9.00E-03	1.94E-03	8.71E-06	9.00E-03	9.68E-04
Trans-1,2 Dichloroethylene	3.43E-02	2.00E-02	1.71E+00	6.60E-03	2.00E-02	3.30E-01
Diethyl Phthalate	4.11E-03	1.30E+01	3.16E-04	3.47E-04	1.30E+01	2.67E-05
Ethyl Benzene	4.19E-08	1.00E-01	4.19E-07	1.48E-08	1.00E-01	1.48E-07
Lead	2.57E-08	NA	0.00E+00	2.02E-09	NA	0.00E+00
Mercury	1.17E-11	2.00E-03	5.87E-09	5.87E-12	2.00E-03	2.94E-09
Tetrachloroethylene	1.23E-05	1.00E-02	1.23E-03	6.14E-06	1.00E-02	6.14E-04
Toluene	2.52E-08	3.00E-01	8.39E-08	1.66E-09	3.00E-01	5.53E-09
Trichloroethylene	9.43E-04	1.30E-02	7.25E-02	4.95E-04	1.30E-02	3.81E-02
Vinyl Chloride	8.86E-05	NA	0.00E+00	4.43E-05	NA	0.00E+00
Xylenes	1.19E-07	1.00E-02	1.19E-05	3.57E-08	1.00E-02	3.57E-06

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-21

CHRONIC HAZARD INDEX
ONSITE CHILD RESIDENTS AT SITE 2
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Barium	0.00E+00	5.10E-02	0.00E+00	0.00E+00	5.10E-02	0.00E+00
Benzene	2.57E-05	NA	0.00E+00	1.29E-05	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	1.31E-05	9.00E-03	1.45E-03	6.54E-06	9.00E-03	7.26E-04
Trans-1,2 Dichloroethylene	2.57E-02	2.00E-02	1.29E+00	4.95E-03	2.00E-02	2.48E-01
Diethyl Phthalate	3.09E-03	1.30E+01	2.37E-04	2.60E-04	1.30E+01	2.00E-05
Ethyl Benzene	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Mercury	0.00E+00	2.00E-03	0.00E+00	0.00E+00	2.00E-03	0.00E+00
Tetrachloroethylene	9.21E-06	1.00E-02	9.21E-04	4.61E-06	1.00E-02	4.61E-04
Toluene	0.00E+00	3.00E-01	0.00E+00	0.00E+00	3.00E-01	0.00E+00
Trichloroethylene	7.07E-04	1.30E-02	5.44E-02	3.71E-04	1.30E-02	2.86E-02
Vinyl Chloride	6.64E-05	NA	0.00E+00	3.32E-05	NA	0.00E+00
Xylenes	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-22

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	1.75E-13	NA (c)	0.00E+00	6.21E-09	NA	0.00E+00
Barium	1.40E-11	1.40E-04	9.98E-08	2.47E-07	5.10E-02	4.85E-06
Benzene	1.18E-13	NA	0.00E+00	4.19E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	4.26E-15	NA	0.00E+00	1.51E-10	2.00E-02	7.55E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	2.46E-13	NA	0.00E+00	8.72E-09	1.00E-01	8.72E-08
Lead	2.56E-12	NA	0.00E+00	1.36E-08	NA	0.00E+00
Mercury	9.47E-15	5.10E-05	1.86E-10	2.35E-11	2.00E-03	1.17E-08
Tetrachloroethylene	1.09E-13	NA	0.00E+00	3.86E-09	1.00E-02	3.86E-07
Toluene	1.71E-12	1.50E+00	1.14E-12	6.04E-08	3.00E-01	2.01E-07
Trichloroethylene	7.58E-14	NA	0.00E+00	2.68E-09	1.30E-02	2.06E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	8.53E-12	4.00E-01	2.13E-11	3.02E-07	1.00E-02	3.02E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-23

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	1.28E-13	NA (c)	0.00E+00	4.53E-09	NA	0.00E+00
Barium	4.13E-12	1.40E-04	2.95E-08	7.31E-08	5.10E-02	1.43E-06
Benzene	5.86E-14	NA	0.00E+00	2.08E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	2.13E-15	NA	0.00E+00	7.55E-11	2.00E-02	3.77E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	1.58E-13	NA	0.00E+00	5.58E-09	1.00E-01	5.58E-08
Lead	6.25E-13	NA	0.00E+00	3.32E-09	NA	0.00E+00
Mercury	4.74E-15	5.10E-05	9.29E-11	1.17E-11	2.00E-03	5.87E-09
Tetrachloroethylene	5.46E-14	NA	0.00E+00	1.93E-09	1.00E-02	1.93E-07
Toluene	1.53E-13	1.50E+00	1.02E-13	5.41E-09	3.00E-01	1.80E-08
Trichloroethylene	3.79E-14	NA	0.00E+00	1.34E-09	1.30E-02	1.03E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	3.25E-12	4.00E-01	8.13E-12	1.15E-07	1.00E-02	1.15E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-24

CHRONIC HAZARD INDEX FOR ADULTS NEAR SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	3.65E-14	NA (c)	0.00E+00	6.21E-09	NA	0.00E+00
Barium	2.91E-12	1.40E-04	2.08E-08	2.47E-07	5.10E-02	4.85E-06
Benzene	2.47E-14	NA	0.00E+00	4.19E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	8.88E-16	NA	0.00E+00	1.51E-10	2.00E-02	7.55E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	5.13E-14	NA	0.00E+00	8.72E-09	1.00E-01	8.72E-08
Lead	5.33E-13	NA	0.00E+00	1.36E-08	NA	0.00E+00
Mercury	1.97E-15	5.10E-05	3.87E-11	2.35E-11	2.00E-03	1.17E-08
Tetrachloroethylene	2.27E-14	NA	0.00E+00	3.86E-09	1.00E-02	3.86E-07
Toluene	3.55E-13	1.50E+00	2.37E-13	6.04E-08	3.00E-01	2.01E-07
Trichloroethylene	1.58E-14	NA	0.00E+00	2.68E-09	1.30E-02	2.06E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	1.78E-12	4.00E-01	4.44E-12	3.02E-07	1.00E-02	3.02E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-25

CHRONIC HAZARD INDEX FOR ADULTS NEAR SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	2.66E-14	NA (c)	0.00E+00	4.53E-09	NA	0.00E+00
Barium	8.60E-13	1.40E-04	6.15E-09	7.31E-08	5.10E-02	1.43E-06
Benzene	1.22E-14	NA	0.00E+00	2.08E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	4.44E-16	NA	0.00E+00	7.55E-11	2.00E-02	3.77E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	3.28E-14	NA	0.00E+00	5.58E-09	1.00E-01	5.58E-08
Lead	1.30E-13	NA	0.00E+00	3.32E-09	NA	0.00E+00
Mercury	9.87E-16	5.10E-05	1.93E-11	1.17E-11	2.00E-03	5.87E-09
Tetrachloroethylene	1.14E-14	NA	0.00E+00	1.93E-09	1.00E-02	1.93E-07
Toluene	3.18E-14	1.50E+00	2.12E-14	5.41E-09	3.00E-01	1.80E-08
Trichloroethylene	7.90E-15	NA	0.00E+00	1.34E-09	1.30E-02	1.03E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	6.77E-13	4.00E-01	1.69E-12	1.15E-07	1.00E-02	1.15E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-26

CHRONIC HAZARD INDEX FOR CHILDREN NEAR SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Child			Oral-Child		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	2.40E-14	NA (c)	0.00E+00	6.52E-09	NA	0.00E+00
Barium	1.91E-12	1.40E-04	1.36E-08	2.60E-07	5.10E-02	5.09E-06
Benzene	1.62E-14	NA	0.00E+00	4.40E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	5.83E-16	NA	0.00E+00	1.59E-10	2.00E-02	7.93E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	3.37E-14	NA	0.00E+00	9.16E-09	1.00E-01	9.16E-08
Lead	3.50E-13	NA	0.00E+00	3.80E-08	NA	0.00E+00
Mercury	1.30E-15	5.10E-05	2.54E-11	2.47E-11	2.00E-03	1.23E-08
Tetrachloroethylene	1.49E-14	NA	0.00E+00	4.05E-09	1.00E-02	4.05E-07
Toluene	2.33E-13	1.50E+00	1.55E-13	6.34E-08	3.00E-01	2.11E-07
Trichloroethylene	1.04E-14	NA	0.00E+00	2.82E-09	1.30E-02	2.17E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	1.17E-12	4.00E-01	2.91E-12	3.17E-07	1.00E-02	3.17E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-27

CHRONIC HAZARD INDEX FOR CHILDREN NEAR SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Child			Oral-Child		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	1.75E-14	NA (c)	0.00E+00	4.76E-09	NA	0.00E+00
Barium	5.65E-13	1.40E-04	4.03E-09	7.68E-08	5.10E-02	1.51E-06
Benzene	8.02E-15	NA	0.00E+00	2.18E-09	NA	0.00E+00
Dibutyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
1,1 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	9.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	2.91E-16	NA	0.00E+00	7.93E-11	2.00E-02	3.96E-09
Diethyl Phthalate	0.00E+00	NA	0.00E+00	0.00E+00	1.30E+01	0.00E+00
Ethyl Benzene	2.15E-14	NA	0.00E+00	5.86E-09	1.00E-01	5.86E-08
Lead	8.55E-14	NA	0.00E+00	9.30E-09	NA	0.00E+00
Mercury	6.48E-16	5.10E-05	1.27E-11	1.23E-11	2.00E-03	6.16E-09
Tetrachloroethylene	7.46E-15	NA	0.00E+00	2.03E-09	1.00E-02	2.03E-07
Toluene	2.09E-14	1.50E+00	1.39E-14	5.68E-09	3.00E-01	1.89E-08
Trichloroethylene	5.19E-15	NA	0.00E+00	1.41E-09	1.30E-02	1.09E-07
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	4.44E-13	4.00E-01	1.11E-12	1.21E-07	1.00E-02	1.21E-05

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-28

RISK FROM POTENTIAL CARCINOGENS
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 2
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	4.53E-09	1.50E+01	6.79E-08	2.78E-09	1.50E+01	4.18E-08
Barium	2.20E-07	- (b)	0.00E+00	4.77E-08	-	0.00E+00
Benzene	3.43E-05	2.90E-02	9.94E-07	1.71E-05	2.90E-02	4.97E-07
Dibutyl Phthalate	3.35E-09	-	0.00E+00	2.76E-09	-	0.00E+00
1,1 Dichloroethylene	1.74E-05	6.00E-01	1.05E-05	8.71E-06	6.00E-01	5.23E-06
Trans-1,2 Dichloroethylene	3.43E-02	-	0.00E+00	6.60E-03	-	0.00E+00
Diethyl Phthalate	4.11E-03	-	0.00E+00	3.47E-04	-	0.00E+00
Ethyl Benzene	4.19E-08	-	0.00E+00	1.48E-08	-	0.00E+00
Lead	2.57E-08	NA (c)	0.00E+00	2.02E-09	NA	0.00E+00
Mercury	1.17E-11	-	0.00E+00	5.87E-12	-	0.00E+00
Tetrachloroethylene	1.23E-05	-	0.00E+00	6.14E-06	-	0.00E+00
Toluene	2.52E-08	-	0.00E+00	1.66E-09	-	0.00E+00
Trichloroethylene	9.43E-04	1.10E-02	1.04E-05	4.95E-04	1.10E-02	5.45E-06
Vinyl Chloride	8.86E-05	2.30E+00	2.04E-04	4.43E-05	2.30E+00	1.02E-04
Xylenes	1.19E-07	-	0.00E+00	3.57E-08	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

TABLE P-29

RISK FROM POTENTIAL CARCINOGENS
ONSITE CHILD RESIDENTS AT SITE 2
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	0.00E+00	1.50E+01	0.00E+00	0.00E+00	1.50E+01	0.00E+00
Barium	0.00E+00	- (b)	0.00E+00	0.00E+00	-	0.00E+00
Benzene	2.57E-05	2.90E-02	7.46E-07	1.29E-05	2.90E-02	3.73E-07
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	1.31E-05	6.00E-01	7.84E-06	6.54E-06	6.00E-01	3.92E-06
Trans-1,2 Dichloroethylene	2.57E-02	-	0.00E+00	4.95E-03	-	0.00E+00
Diethyl Phthalate	3.09E-03	-	0.00E+00	2.60E-04	-	0.00E+00
Ethyl Benzene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Tetrachloroethylene	9.21E-06	-	0.00E+00	4.61E-06	-	0.00E+00
Toluene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Trichloroethylene	7.07E-04	1.10E-02	7.78E-06	3.71E-04	1.10E-02	4.08E-06
Vinyl Chloride	6.64E-05	2.30E+00	1.53E-04	3.32E-05	2.30E+00	7.64E-05
Xylenes	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

TABLE P-30

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	1.75E-13	5.00E+01	8.76E-12	6.21E-09	1.50E+01	9.31E-08
Barium	1.40E-11	- (b)	0.00E+00	2.47E-07	-	0.00E+00
Benzene	1.18E-13	2.90E-02	3.43E-15	4.19E-09	2.90E-02	1.22E-10
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	0.00E+00	1.16E+00	0.00E+00	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	4.26E-15	-	0.00E+00	1.51E-10	-	0.00E+00
Diethyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	2.46E-13	-	0.00E+00	8.72E-09	-	0.00E+00
Lead	2.56E-12	NA (c)	0.00E+00	1.36E-08	NA	0.00E+00
Mercury	9.47E-15	-	0.00E+00	2.35E-11	-	0.00E+00
Tetrachloroethylene	1.09E-13	-	0.00E+00	3.86E-09	-	0.00E+00
Toluene	1.71E-12	-	0.00E+00	6.04E-08	-	0.00E+00
Trichloroethylene	7.58E-14	NA	0.00E+00	2.68E-09	1.10E-02	2.95E-11
Vinyl Chloride	0.00E+00	2.50E-02	0.00E+00	0.00E+00	2.30E+00	0.00E+00
Xylenes	8.53E-12	-	0.00E+00	3.02E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available

TABLE P-31

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	4.13E-12	5.00E+01	2.06E-10	4.53E-09	1.50E+01	6.79E-08
Barium	5.86E-14	- (b)	0.00E+00	7.31E-08	-	0.00E+00
Benzene	0.00E+00	2.90E-02	0.00E+00	2.08E-09	2.90E-02	6.02E-11
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	2.13E-15	1.16E+00	2.47E-15	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	0.00E+00	-	0.00E+00	7.55E-11	-	0.00E+00
Diethyl Phthalate	1.58E-13	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	6.25E-13	-	0.00E+00	5.58E-09	-	0.00E+00
Lead	4.74E-15	NA (c)	0.00E+00	3.32E-09	NA	0.00E+00
Mercury	5.46E-14	-	0.00E+00	1.17E-11	-	0.00E+00
Tetrachloroethylene	1.53E-13	-	0.00E+00	1.93E-09	-	0.00E+00
Toluene	3.79E-14	-	0.00E+00	5.41E-09	-	0.00E+00
Trichloroethylene	0.00E+00	NA	0.00E+00	1.34E-09	1.10E-02	1.48E-11
Vinyl Chloride	3.25E-12	2.50E-02	8.13E-14	0.00E+00	2.30E+00	0.00E+00
Xylenes	0.00E+00	-	0.00E+00	1.15E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available

TABLE P-32

RISK FROM POTENTIAL CARCINOGENS FOR ADULTS NEAR SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	3.65E-14	5.00E+01	1.83E-12	6.21E-09	1.50E+01	9.31E-08
Barium	2.91E-12	- (b)	0.00E+00	2.47E-07	-	0.00E+00
Benzene	2.47E-14	2.90E-02	7.15E-16	4.19E-09	2.90E-02	1.22E-10
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	0.00E+00	1.16E+00	0.00E+00	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	8.88E-16	-	0.00E+00	1.51E-10	-	0.00E+00
Diethyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	5.13E-14	-	0.00E+00	8.72E-09	-	0.00E+00
Lead	5.33E-13	NA (c)	0.00E+00	1.36E-08	NA	0.00E+00
Mercury	1.97E-15	-	0.00E+00	2.35E-11	-	0.00E+00
Tetrachloroethylene	2.27E-14	-	0.00E+00	3.86E-09	-	0.00E+00
Toluene	3.55E-13	-	0.00E+00	6.04E-08	-	0.00E+00
Trichloroethylene	1.58E-14	NA	0.00E+00	2.68E-09	1.10E-02	2.95E-11
Vinyl Chloride	0.00E+00	2.50E-02	0.00E+00	0.00E+00	2.30E+00	0.00E+00
Xylenes	1.78E-12	-	0.00E+00	3.02E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

TABLE P-33

RISK FROM POTENTIAL CARCINOGENS FOR ADULTS NEAR SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	2.66E-14	5.00E+01	1.33E-12	4.53E-09	1.50E+01	6.79E-08
Barium	8.60E-13	- (b)	0.00E+00	7.31E-08	-	0.00E+00
Benzene	1.22E-14	2.90E-02	3.54E-16	2.08E-09	2.90E-02	6.02E-11
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	0.00E+00	1.16E+00	0.00E+00	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	4.44E-16	-	0.00E+00	7.55E-11	-	0.00E+00
Diethyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	3.28E-14	-	0.00E+00	5.58E-09	-	0.00E+00
Lead	1.30E-13	NA (c)	0.00E+00	3.32E-09	NA	0.00E+00
Mercury	9.87E-16	-	0.00E+00	1.17E-11	-	0.00E+00
Tetrachloroethylene	1.14E-14	-	0.00E+00	1.93E-09	-	0.00E+00
Toluene	3.18E-14	-	0.00E+00	5.41E-09	-	0.00E+00
Trichloroethylene	7.90E-15	NA	0.00E+00	1.34E-09	[illegible]10E-02	1.43E-11
Vinyl Chloride	0.00E+00	2.50E-02	0.00E+00	0.00E+00	2.30E+00	0.00E+00
Xylenes	6.77E-13	-	0.00E+00	1.15E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

TABLE P-34

RISK FROM POTENTIAL CARCINOGENS FOR CHILDREN NEAR SITE 2
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Child			Oral-Child		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	2.40E-14	5.00E+01	1.20E-12	6.52E-09	1.50E+01	9.77E-08
Barium	1.91E-12	- (b)	0.00E+00	2.60E-07	-	0.00E+00
Benzene	1.62E-14	2.90E-02	4.69E-16	4.40E-09	2.90E-02	1.28E-10
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	0.00E+00	1.16E+00	0.00E+00	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	5.83E-16	-	0.00E+00	1.59E-10	-	0.00E+00
Diethyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	3.37E-14	-	0.00E+00	9.16E-09	-	0.00E+00
Lead	3.50E-13	NA (c)	0.00E+00	3.80E-08	NA	0.00E+00
Mercury	1.30E-15	-	0.00E+00	2.47E-11	-	0.00E+00
Tetrachloroethylene	1.49E-14	-	0.00E+00	4.05E-09	-	0.00E+00
Toluene	2.33E-13	-	0.00E+00	6.34E-08	-	0.00E+00
Trichloroethylene	1.04E-14	NA	0.00E+00	2.82E-09	1.10E-02	3.10E-11
Vinyl Chloride	0.00E+00	2.50E-02	0.00E+00	0.00E+00	2.30E+00	0.00E+00
Xylenes	1.17E-12	-	0.00E+00	3.17E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

TABLE P-35

RISK FROM POTENTIAL CARCINOGENS FOR CHILDREN NEAR SITE 2
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Child CDI (a) (mg/kg/day)	Inhalation-Child Potency Factor (1/mg/kg/day)	Inhalation-Child Route-Specific Risk	Oral-Child CDI (mg/kg/day)	Oral-Child Potency Factor (1/mg/kg/day)	Oral-Child Route-Specific Risk
Arsenic	1.75E-14	5.00E+01	8.74E-13	4.76E-09	1.50E+01	7.13E-08
Barium	5.65E-13	- (b)	0.00E+00	7.68E-08	-	0.00E+00
Benzene	8.02E-15	2.90E-02	2.33E-16	2.18E-09	2.90E-02	6.32E-11
Dibutyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1 Dichloroethylene	0.00E+00	1.16E+00	0.00E+00	0.00E+00	6.00E-01	0.00E+00
Trans-1,2 Dichloroethylene	2.91E-16	-	0.00E+00	7.93E-11	-	0.00E+00
Diethyl Phthalate	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	2.15E-14	-	0.00E+00	5.86E-09	-	0.00E+00
Lead	8.55E-14	NA (c)	0.00E+00	9.30E-09	NA	0.00E+00
Mercury	6.48E-16	-	0.00E+00	1.23E-11	-	0.00E+00
Tetrachloroethylene	7.46E-15	-	0.00E+00	2.03E-09	-	0.00E+00
Toluene	2.09E-14	-	0.00E+00	5.68E-09	-	0.00E+00
Trichloroethylene	5.19E-15	NA	0.00E+00	1.41E-09	1.10E-02	1.55E-11
Vinyl Chloride	0.00E+00	2.50E-02	0.00E+00	0.00E+00	2.30E+00	0.00E+00
Xylenes	4.44E-13	-	0.00E+00	1.21E-07	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to compound
c. NA = Data not available.

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SECTION P.3

SITE 3 RISK ASSESSMENT TABLES

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SECTION P.3
SITE 3 RISK ASSESSMENT TABLES

This section contains the risk assessment work sheets for Site 3.

P.3.1 Site 3 Indicator Chemical Selection

Data used in the selection of indicator chemicals were compiled from the Remedial Investigation performed at the Base by ES in 1988, the 1986 Phase II Stage 2 study (Dames & Moore, 1987) and the 1983 Phase II Stage 1 study (Weston, 1984). These data are summarized in Table P-36, while Tables P-37 through P-40 step through the USEPA selection process.

P.3.2 Site 3 Estimation of Chemical Intake for Each Pathway

Tables P-41 through P-47 summarize the upper bound and best estimate chronic daily intakes from each potential pathway for each population at risk, as calculated from the maximum and average indicator chemical concentrations, respectively.

P.3.3 Site 3 Estimation of Total Chemical Intake for Each Exposure Route

Chronic daily intakes for pathways categorized as oral or inhalation routes were summed to yield total chronic daily intake via a particular route for a target population. Tables P-48 through P-52 present the total chemical intake for each exposure route.

P.3.4 Site 3 Characterization of Risk From Noncarcinogens

Tables P-53 through P-58 present the chronic hazard index values for each target population.

P.3.5 Site 3 Characterization of Risk From Potential Carcinogens

Tables P-59 through P-64 present the risk from potential carcinogens for each target population.

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TABLE P-36

MAXIMUM AND REPRESENTATIVE CHEMICAL CONCENTRATIONS AT SITE 3

Parameter	CAS (a) Number	Ground Water (mg/L)			Surface Water (mg/L)			Sediment (mg/kg)			Soils at 0 to 2 Feet (mg/kg)			Soils Below 2 Feet (mg/kg)		
		Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed
Arsenic	7440-38-2	ND (b)	ND	0/20	2.00E-02	1.00E-02	1/7	5.90E+01	3.23E+01	3/7	ND	ND	0/47	ND	ND	0/26
Barium	7440-39-3	1.00E+00	6.33E-01	3/19	6.00E-01	3.50E-01	2/7	3.10E+02	8.90E+01	7/7	1.21E+02	6.98E+01	47/47	1.20E+02	4.85E+01	26/26
Benzene	71-43-2	3.60E-02	1.02E-02	4/20	ND	ND	0/7	ND	ND	0/7	9.00E-01	4.50E-01	1/47	ND	ND	0/26
Cadmium	7740-43-9	ND	ND	0/20	1.40E-01	1.00E-01	2/7	9.03E+00	7.88E+00	4/7	1.94E+01	1.04E+01	45/47	1.10E+01	8.99E+00	17/26
Chromium	7440-47-3	7.10E-01	3.05E-01	4/20	2.00E-01	1.00E-01	1/7	7.80E+01	3.49E+01	7/7	4.43E+01	3.19E+01	47/47	3.80E+01	2.82E+01	26/26
4,4' DDD	72-54-8	ND	ND	0/20	ND	ND	0/7	ND	ND	0/7	4.90E-01	2.13E-01	4/47	ND	ND	0/26
4,4' DDE	72-55-9	ND	ND	0/16	ND	ND	0/4	ND	ND	0/7	6.10E-02	1.37E-02	3/47	2.90E-02	1.45E-02	2/26
4,4' DDT	50-29-3	ND	ND	0/20	ND	ND	0/7	ND	ND	0/7	5.00E-01	8.94E-02	10/47	1.10E-01	4.88E-02	4/26
Delta BHC	319-86-8	ND	ND	0/16	ND	ND	0/4	ND	ND	0/7	ND	ND	0/47	2.00E-03	1.00E-03	2/21
1,4 Dichlorobenzene	106-46-7	9.10E-04	4.55E-04	9/16	ND	ND	0/4	ND	ND	0/4	ND	ND	0/44	ND	ND	0/17
1,1 Dichloroethane	75-34-3	3.10E-01	1.11E-01	9/29	3.70E-02	2.04E-02	4/7	5.60E-03	3.29E-03	3/9	2.20E-02	1.35E-02	4/67	2.50E-04	1.25E-04	1/26
1,2 Dichloroethane	107-06-2	4.70E-03	3.46E-03	5/20	3.00E-03	2.90E-03	2/7	ND	ND	0/6	1.80E-02	6.75E-03	4/67	ND	ND	0/17
1,1 Dichloroethylene	75-35-4	5.80E-02	2.16E-02	9/20	3.50E-02	1.68E-02	4/7	2.40E-02	2.10E-02	3/9	3.70E-02	1.95E-02	6/67	ND	ND	0/26
Trans-1,2 Dichloroethylene	540-59-0	4.50E-01	1.23E-01	8/20	8.20E-02	5.41E-02	4/7	5.00E-01	3.15E-01	3/9	1.40E-02	1.00E-02	2/67	ND	ND	0/26
Diethyl Phthalate	84-66-2	1.60E-02	8.00E-03	1/16	ND	ND	0/4	ND	ND	0/4	1.50E+00	1.02E+00	2/47	ND	ND	0/17
Endosulfan Sulfate	115-29-7	ND	ND	0/16	ND	ND	0/4	9.70E-02	5.50E-02	2/4	ND	ND	0/47	ND	ND	0/26
Ethyl Benzene	100-41-4	ND	ND	0/16	ND	ND	0/4	ND	ND	0/4	2.60E-01	1.30E-01	1/47	ND	ND	0/26
Lead	7439-92-1	3.00E-02	1.50E-02	1/20	7.60E-01	3.13E-01	3/7	4.78E+02	1.26E+02	6/7	3.03E+01	9.70E+00	45/47	8.20E+00	4.27E+00	17/26
Mercury	7439-97-6	ND	ND	0/20	ND	ND	0/7	5.80E-01	4.40E-01	2/7	2.80E-01	1.40E-01	1/47	ND	ND	0/26
PCB's	1336-36-3	4.50E-02	3.46E-02	5/16	ND	ND	0/4	3.40E+00	1.22E+00	3/4	ND	ND	0/47	ND	ND	0/26
Tetrachloroethylene	127-18-4	1.00E+00	4.06E-01	9/20	1.00E-02	7.30E-03	4/7	5.10E-03	3.80E-03	2/9	3.00E+00	8.23E-02	7/67	4.10E-04	2.05E-04	1/26

TABLE P-36 (CONTINUED)

MAXIMUM AND REPRESENTATIVE CHEMICAL CONCENTRATIONS AT SITE 3

Parameter	CAS (a) Number	Ground Water (mg/L)			Surface Water (mg/L)			Sediment (mg/kg)			Soils at 0 to 2 Feet (mg/kg)			Soils Below 2 Feet (mg/kg)		
		Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed	Maximum Value	Represent-ative Value	# Detected/ # Analyzed
Toluene	108-88-3	2.10E-02	1.46E-02	3/20	ND	ND	0/7	8.40E-02	4.20E-02	1/7	1.30E+00	8.39E-02	34/47	7.40E-02	7.97E-02	9/26
1,1,1 Trichloroethane	71-55-6	3.10E+00	1.08E+00	10/20	1.40E+00	6.01E-01	4/7	2.40E-01	4.58E-02	6/9	2.10E-01	4.89E-02	4/67	ND	ND	0/26
Trichloroethylene	79-01-6	7.90E-01	8.89E-02	10/20	7.40E-01	3.56E-01	5/7	1.40E-01	4.63E-02	5/9	9.40E-01	1.93E-01	6/67	4.40E-03	3.75E-02	2/26
Vinyl Chloride	75-01-4	9.10E-03	4.98E-03	4/20	6.00E-03	4.60E-03	3/7	4.20E-03	8.40E-03	1/7	ND	ND	0/47	ND	ND	0/26
Xylenes	1330-20-7	ND	ND	0/20	ND	ND	0/7	ND	ND	0/7	2.00E+00	1.11E+00	2/47	ND	ND	0/26

a. CAS = Chemical Abstracts Service
b. ND = Not Detected

Source: Engineering-Science, Inc. (198[illegible]), Dames & Moore (1987) and Weston (1984)

TABLE P-37

TOXICITY DATA FOR COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	Water (wT) (e) (L/mg)	Soil (sT) (f) (kg/mg)	Water (wT) (L/mg)	Soil (sT) (kg/mg)
Arsenic	7440-38-2	NC, PC (g)	9	9	A	A	1.80E+01	9.00E-04	4.07E+00	2.03E-04
Barium	7440-39-3	NC	10	10	D	D	4.08E+00	2.04E-04	- (h)	-
Benzene	71-43-2	NC, PC	5	10	A	A	1.17E-01	5.85E-06	7.71E-03	3.86E-07
Cadmium	7740-43-9	NC, PC	-	8	-	B1	NA (i)	NA	NA	NA
Chromium	7440-47-3	NC, PC	-	8	-	A	NA	NA	NA	NA
4,4' DDD	72-54-8	NC, PC	-	-	B2	B2	NA	NA	3.71E-02	1.86E-06
4,4' DDE	72-55-9	NC, PC	-	-	B2	B2	NA	NA	1.13E-01	5.64E-06
4,4' DDT	50-29-3	NC, PC	-	-	B2	B2	NA	NA	1.59E-01	7.97E-06
Delta BHC	319-86-8	NC	-	-	D	D	NA	NA	-	-
1,4 Dichlorobenzene	106-46-7	NC	4	5	D	D	5.19E-02	2.60E-06	-	-
1,1 Dichloroethane	75-34-3	NC	7	7	D	D	2.58E-02	1.29E-06	-	-
1,2 Dichloroethane	107-06-2	NC, PC	10	8	B2	B2	1.76E-02	8.80E-07	5.86E-02	2.93E-06
1,1 Dichloroethylene	75-35-4	NC, PC	7	5	C	C	3.71E-01	1.86E-05	1.23E-01	6.14E-06
Trans-1,2 Dichloroethylene	540-59-0	NC	5	5	D	D	5.29E-02	2.65E-06	-	-
Diethyl Phthalate	84-66-2	NC	4	4	D	D	2.67E-04	1.34E-08	-	-
Endosulfan Sulfate	115-29-7	NC	-	-	D	D	NA	NA	-	-
Ethyl Benzene	100-41-4	NC	4	4	D	D	1.10E-02	5.52E-07	-	-
Lead	7439-92-1	NC, PC	10	10	B2	B2	8.93E-01	4.46E-05	NA	NA
Mercury	7439-97-6	NC	7	8	D	D	1.84E+01	9.21E-04	-	-
PCB's	1336-36-3	NC, PC	-	-	B2	B2	NA	NA	5.71E-01	2.86E-05

TABLE P-37 (CONTINUED)

TOXICITY DATA FOR CO..'""S DETECTED AT SITE 3

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	Water (wT) (e) (L/mg)	Soil (sT) (f) (kg/mg)	Water (wT) (L/mg)	Soil (sT) (kg/mg)
Tetrachloroethylene	127-18-4	NC, PC	7	10	B2	B2	9.62E-03	4.81E-07	8.86E-03	4.43E-07
Toluene	108-88-3	NC	7	10	D	D	5.20E-03	2.60E-07	-	-
1,1,1 Trichloroethane	71-55-6	NC	2	2	D	D	7.33E-04	3.67E-08	-	-
Trichloroethylene	79-01-6	NC, PC	5	4	B2	B2	1.05E+00	5.26E-05	4.29E-03	2.14E-07
Vinyl Chloride	75-01-4	NC, PC	10	10	A	A	8.77E-02	4.39E-06	4.29E-03	2.14E-07
Xylenes	1330-20-7	NC	8	8	D	D	1.07E-01	5.33E-06	-	-

a. CAS = Chemical Abstracts Service
b. Rating Value = RVe = USEPA health effect rating value for noncarinogens
c. Carcinogen Assessment Group = CAG = USEPA classification of carcinogenicity
d. Toxicity Constant = USEPA potency factor based on either carcinogenic or noncarcinogenic endpoints for a given medium
e. wT = Water toxicity constant
f. sT = Soil toxicity constant
g. NC = Noncarcinogenic effects PC = Potential Carcinogen
h. Not applicable to parameter
i. NA = No data available

Source: U.S. Environmental Protection Agency (1986a)

TABLE P-38

CT VALUES FOR NONCARCINOGENIC COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils: 0 to 2 Feet		CT Values for Soils: Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Arsenic	7440-38-2	0.00E+00	0.00E+00	3.60E-01	1.80E-01	5.31E-05	2.91E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	7440-39-3	4.08E+00	2.58E+00	2.45E+00	1.43E+00	6.32E-05	1.81E-05	2.47E-05	1.42E-05	2.45E-05	9.89E-06
Benzene	71-43-2	4.21E-03	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.27E-06	2.63E-06	0.00E+00	0.00E+00
Cadmium	7740-43-9	- (c)	-	-	-	-	-	-	-	-	-
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
4,4' DDD	72-54-8	-	-	-	-	-	-	-	-	-	-
4,4' DDE	72-55-9	-	-	-	-	-	-	-	-	-	-
4,4' DDT	50-29-3	-	-	-	-	-	-	-	-	-	-
Delta BHC	319-86-8	-	-	-	-	-	-	-	-	-	-
1,4 Dichlorobenzene	106-46-7	4.72E-05	2.36E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	75-34-3	8.00E-03	2.85E-03	9.55E-04	5.26E-04	7.22E-09	4.24E-09	2.84E-08	1.74E-08	3.22E-10	1.61E-10
1,2 Dichloroethane	107-06-2	8.27E-05	6.09E-05	5.28E-05	5.10E-05	0.00E+00	0.00E+00	1.58E-08	5.94E-09	0.00E+00	0.00E+00
1,1 Dichloroethylene	75-35-4	2.15E-02	8.03E-03	1.30E-02	6.24E-03	4.46E-07	3.91E-07	6.88E-07	3.63E-07	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	540-59-0	2.38E-02	6.53E-03	4.34E-03	2.86E-03	1.33E-06	8.34E-07	3.71E-08	2.65E-08	0.00E+00	0.00E+00
Diethyl Phthalate	84-66-2	4.27E-06	2.14E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-08	1.37E-08	0.00E+00	0.00E+00
Endosulfan Sulfate	115-29-7	-	-	-	-	-	-	-	-	-	-
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-07	7.18E-08	0.00E+00	0.00E+00
Lead	7439-92-1	2.68E-02	1.34E-02	6.79E-01	2.80E-01	2.13E-05	5.64E-06	1.35E-06	4.33E-07	3.65E-07	1.90E-07
Mercury	7439-97-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.34E-07	4.05E-07	2.58E-07	1.29E-07	0.00E+00	0.00E+00
PCB's	1336-36-3	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene	127-18-4	9.62E-03	3.91E-03	9.62E-05	7.02E-05	2.45E-09	1.83E-09	1.44E-06	3.96E-08	1.97E-10	9.86E-11

TABLE P-38 (CONTINUED)

CT VALUES FOR NONCARCINOGENIC COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Toluene	108-88-3	1.09E-04	7.61E-05	0.00E+00	0.00E+00	2.18E-08	1.09E-08	3.38E-07	2.22E-08	1.92E-07	2.70E-08
1,1,1 Trichloroethane	71-55-6	2.27E-03	7.93E-04	1.03E-03	4.40E-04	8.81E-09	1.6[illegible]-09	7.71E-09	1.80E-09	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	8.30E-01	9.33E-02	7.77E-01	3.74E-01	7.36E-06	2.44E-06	4.94E-05	1.02E-05	2.10E-07	1.97E-06
Vinyl Chloride	75-01-4	7.98E-04	4.36E-04	5.26E-04	4.03E-04	1.84E-08	3.69E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-05	5.92E-06	0.00E+00	0.00E+00

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-39

CT VALUES FOR POTENTIALLY CARCINOGENIC COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils: 0 to 2 Feet		CT Values for Soils: Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Arsenic	7440-38-2	0.00E+00	0.00E+00	8.14E-02	4.07E-02	1.20E-05	6.56E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	7440-39-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	71-43-2	2.78E-04	7.83E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E-07	1.74E-07	0.00E+00	0.00E+00
Cadmium	7740-43-9	- (c)	-	-	-	-	-	-	-	-	-
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
4,4' DDD	72-54-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.11E-07	3.96E-07	0.00E+00	0.00E+00
4,4' DDE	72-55-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-07	2.46E-07	1.64E-07	8.18E-08
4,4' DDT	50-29-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.98E-06	7.13E-07	8.77E-07	3.89E-07
Delta BHC	319-86-8	-	-	-	-	-	-	-	-	-	-
1,4 Dichlorobenzene	106-46-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	75-34-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2 Dichloroethane	107-06-2	2.75E-04	2.03E-04	1.76E-04	1.70E-04	0.00E+00	0.00E+00	5.27E-08	1.98E-08	0.00E+00	0.00E+00
1,1 Dichloroethylene	75-35-4	7.13E-03	2.66E-03	4.31E-03	2.07E-03	1.47E-07	1.29E-07	2.27E-07	1.20E-07	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	540-59-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Diethyl Phthalate	84-66-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Endosulfan Sulfate	115-29-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	7439-92-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	7439-97-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PCB's	1336-36-3	2.57E-02	1.98E-02	0.00E+00	0.00E+00	9.72E-05	3.50E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene	127-18-4	8.86E-03	3.60E-03	8.86E-05	6.47E-05	2.26E-09	1.68E-09	1.33E-06	3.65E-08	1.82E-10	9.08E-11

TABLE P-39 (CONTINUED)

CT VALUES FOR POTENTIALLY CARCINOGENIC COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Toluene	108-88-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,1 Trichloroethane	71-55-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	3.39E-03	3.81E-04	3.17E-03	1.53E-03	3.00E-08	9.91E-09	2.01E-07	4.13E-08	8.56E-10	8.03E-09
Vinyl Chloride	75-01-4	3.90E-05	2.13E-05	2.57E-05	1.97E-05	8.99E-10	1.80E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-10

INDICATOR SCORES AND TENTATIVE RANKING FOR COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Indicator Score for Noncarcinogenic Effects		Tentative Rank for Noncarcinogenic Effects		Indicator Score for Potential Carcinogens		Tentative Rank for Potential Carcinogens	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Arsenic	7440-38-2	5.31E-02	2.91E-02	3	3	1.20E-02	6.56E-03	2	2
Barium	7440-39-3	4.19E+00	2.62E+00	1	1				
Benzene	71-43-2	4.72E-03	1.19E-03	9	9	2.78E-04	7.85E-05	6	7
Cadmium	7740-43-9								
Chromium	7440-47-3								
4,4' DDD	72-54-8					9.11E-07	3.96E-07	10	10
4,4' DDE	72-55-9					5.08E-07	3.28E-07	11	11
4,4' DDT	50-29-3					4.86E-06	1.10E-06	9	9
Delta BHC	319-86-8								
1,4 Dichlorobenzene	106-46-7	4.72E-05	2.36E-05	15	15				
1,1 Dichloroethane	75-34-3	8.00E-03	2.85E-03	8	8				
1,2 Dichloroethane	107-06-2	8.27E-05	6.09E-05	14	14	2.75E-04	2.03E-04	7	6
1,1 Dichloroethylene	75-35-4	2.15E-02	8.03E-03	6	5	7.13E-03	2.66E-03	4	4
Trans-1,2 Dichloroethylene	540-59-0	2.38E-02	6.53E-03	5	6				
Diethyl Phthalate	84-66-2	4.29E-06	2.15E-06	17	17				
Endosulfan Sulfate	115-29-7								
Ethyl Benzene	100-41-4	1.44E-07	7.18E-08	18	18				
Lead	7439-92-1	4.98E-02	1.97E-02	4	4				
Mercury	7439-97-6	7.92E-04	5.34E-04	12	11				
PCB's	1336-36-3					2.58E-02	1.98E-02	1	1
Tetrachloroethylene	127-18-4	9.62E-03	3.91E-03	7	7	8.86E-03	3.60E-03	3	3

TABLE P-40 (CONTINUED)

INDICATOR SCORES AND TENTATIVE RANKING FOR COMPOUNDS DETECTED AT SITE 3

Parameter	CAS (a) Number	Indicator Score for Noncarcinogenic Effects		Tentative Rank for Noncarcinogenic Effects		Indicator Score for Potential Carcinogens		Tentative Rank for Potential Carcinogens	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Toluene	108-88-3	1.10E-04	7.61E-05	13	13				
1,1,1 Trichloroethane	71-55-6	2.27E-03	7.93E-04	10	10				
Trichloroethylene	79-01-6	8.30E-01	3.74E-01	2	2	3.39E-03	1.53E-03	5	5
Vinyl Chloride	75-01-4	7.98E-04	4.36E-04	11	12	3.90E-05	2.13E-05	8	8
Xylenes	1330-20-7	1.07E-05	5.97E-06	16	16				

a. CAS = Chemical Abstracts Service

TABLE P-41

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF SOIL AT DEPTH
FOR WORKERS AT SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (b)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Barium	1.20E+02	4.85E+01	5.00E-01	8.39E-10	1.01E-07	4.07E-08
Benzene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Cadmium	1.10E+01	8.99E+00	8.00E-02	1.34E-10	1.48E-09	1.21E-09
Chromium	3.80E+01	2.82E+01	5.00E-01	8.39E-10	3.19E-08	2.37E-08
4,4' DDT	1.10E-01	4.88E-02	1.00E+00	1.68E-09	1.85E-10	8.18E-11
1,1 Dichloroethane	2.50E-04	1.25E-04	1.00E+00	1.68E-09	4.19E-13	2.10E-13
1,1 Dichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Lead	8.20E+00	4.27E+00	1.50E-01	2.52E-10	2.06E-09	1.07E-09
Mercury	ND	ND	7.00E-02	1.17E-10	0.00E+00	0.00E+00
Tetrachloroethylene	4.10E-04	2.05E-04	1.00E+00	1.68E-09	6.88E-13	3.44E-13
1,1,1 Trichloroethane	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trichloroethylene	4.00E-03	3.75E-02	1.00E+00	1.68E-09	6.71E-12	6.29E-11
Vinyl Chloride	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-42

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER FOR ONSITE ADULT RESIDENTS OR WORKERS AT SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (a)	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Barium	1.00E+00	6.33E-01	5.00E-01	1.43E-02	1.43E-02	9.04E-03
Benzene	3.60E-02	1.02E-02	1.00E+00	2.86E-02	1.03E-03	2.90E-04
Cadmium	ND	ND	8.00E-02	2.29E-03	0.00E+00	0.00E+00
Chromium	7.10E-01	3.05E-01	5.00E-01	1.43E-02	1.01E-02	4.36E-03
4,4' DDT	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
1,1 Dichloroethane	3.10E-01	1.11E-01	1.00E+00	2.86E-02	8.86E-03	3.16E-03
1,1 Dichloroethylene	5.80E-02	2.16E-02	1.00E+00	2.86E-02	1.66E-03	6.18E-04
Trans-1,2 Dichloroethylene	4.50E-01	1.23E-01	1.00E+00	2.86E-02	1.29E-02	3.53E-03
Lead	3.00E-02	1.50E-02	1.50E-01	4.29E-03	1.29E-04	6.43E-05
Mercury	ND	ND	7.00E-02	2.00E-03	0.00E+00	0.00E+00
Tetrachloroethylene	1.00E+00	4.06E-01	1.00E+00	2.86E-02	2.86E-02	1.16E-02
1,1,1 Trichloroethane	3.10E+00	1.08E+00	1.00E+00	2.86E-02	8.86E-02	3.09E-02
Trichloroethylene	7.90E-01	8.89E-02	1.00E+00	2.86E-02	2.26E-02	2.54E-03
Vinyl Chloride	9.10E-03	4.98E-03	1.00E+00	2.86E-02	2.60E-04	1.42E-04

a. ND = Not Detected

TABLE P-43

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER
FOR CHILD RESIDENTS AT SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (a)	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Barium	1.00E+00	6.33E-01	5.00E-01	1.07E-02	1.07E-02	6.78E-03
Benzene	3.60E-02	1.02E-02	1.00E+00	2.14E-02	7.71E-04	2.18E-04
Cadmium	ND	ND	8.00E-02	1.71E-03	0.00E+00	0.00E+00
Chromium	7.10E-01	3.05E-01	5.00E-01	1.07E-02	7.61E-03	3.27E-03
4,4' DDT	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
1,1 Dichloroethane	3.10E-01	1.11E-01	1.00E+00	2.14E-02	6.64E-03	2.37E-03
1,1 Dichloroethylene	5.80E-02	2.16E-02	1.00E+00	2.14E-02	1.24E-03	4.64E-04
Trans-1,2 Dichloroethylene	4.50E-01	1.23E-01	1.00E+00	2.14E-02	9.64E-03	2.65E-03
Lead	3.00E-02	1.50E-02	4.00E-01	8.57E-03	2.57E-04	1.29E-04
Mercury	ND	ND	7.00E-02	1.50E-03	0.00E+00	0.00E+00
Tetrachloroethylene	1.00E+00	4.06E-01	1.00E+00	2.14E-02	2.14E-02	8.71E-03
1,1,1 Trichloroethane	3.10E+00	1.08E+00	1.00E+00	2.14E-02	6.64E-02	2.32E-02
Trichloroethylene	7.90E-01	8.89E-02	1.00E+00	2.14E-02	1.69E-02	1.90E-03
Vinyl Chloride	9.10E-03	4.98E-03	1.00E+00	2.14E-02	1.95E-04	1.07E-04

a. ND = Not Detected

TABLE P-44

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR WORKERS AT SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Barium	1.21E+02	6.98E+01	5.00E-01	8.39E-10	1.01E-07	5.85E-08
Benzene	9.00E-01	4.50E-01	1.00E+00	1.68E-09	1.51E-09	7.55E-10
Cadmium	1.94E+01	1.04E+01	8.00E-02	1.34E-10	2.60E-09	1.40E-09
Chromium	4.43E+01	3.19E+01	5.00E-01	8.39E-10	3.72E-08	2.67E-08
4,4' DDT	5.00E-01	8.94E-02	1.00E+00	1.68E-09	8.39E-10	1.50E-10
1,1 Dichloroethane	2.20E-02	1.35E-02	1.00E+00	1.68E-09	3.69E-11	2.26E-11
1,1 Dichloroethylene	3.70E-02	1.95E-02	1.00E+00	1.68E-09	6.21E-11	3.27E-11
Trans-1,2 Dichloroethylene	1.40E-02	1.00E-02	1.00E+00	1.68E-09	2.35E-11	1.68E-11
Lead	3.03E+01	9.70E+00	1.50E-01	2.52E-10	7.62E-09	2.44E-09
Mercury	2.80E-01	1.40E-01	7.00E-02	1.17E-10	3.29E-11	1.64E-11
Tetrachloroethylene	3.00E+00	8.23E-02	1.00E+00	1.68E-09	5.03E-09	1.38E-10
1,1,1 Trichloroethane	2.10E-01	4.89E-02	1.00E+00	1.68E-09	3.52E-10	8.21E-11
Trichloroethylene	9.40E-01	1.93E-01	1.00E+00	1.68E-09	1.58E-09	3.24E-10
Vinyl Chloride	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-45

CURRENT EXPOSURE POINT INTAKE VIA VOLATILIZATION OF SURFACE WATER
FOR WORKERS AT SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Emission Rate From Water Surface (mg/hr)		Exposure Point Concentration (mg/m3)		Human Intake Factor (m3/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative	Upper Bound	Best Estimate	Upper Bound	Best Estimate		Upper Bound	Best Estimate
Arsenic	2.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Barium	6.00E-01	3.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Benzene	ND (a)	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Cadmium	1.40E-01	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Chromium	2.00E-01	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
4,4' DDT	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
1,1 Dichloroethane	3.70E-02	2.04E-02	4.98E-02	2.75E-02	7.76E-09	4.28E-09	1.94E-03	1.51E-11	8.32E-12
1,1 Dichloroethylene	3.50E-02	1.68E-02	4.76E-02	2.29E-02	7.42E-09	3.56E-09	1.94E-03	1.44E-11	6.93E-12
Trans-1,2 Dichloroethylene	8.20E-02	5.41E-02	1.11E-01	7.35E-02	1.74E-08	1.15E-08	1.94E-03	3.38E-11	2.23E-11
Lead	7.60E-01	3.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Mercury	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Tetrachloroethylene	1.00E-02	7.30E-03	1.04E-02	7.59E-03	1.62E-09	1.18E-09	1.94E-03	3.15E-12	2.30E-12
1,1,1 Trichloroethane	1.40E+00	6.01E-01	1.63E+00	6.98E-01	2.53E-07	1.09E-07	1.94E-03	4.93E-10	2.11E-10
Trichloroethylene	7.40E-01	3.56E-01	8.66E-01	4.15E-01	1.35E-07	6.49E-08	1.94E-03	2.62E-10	1.26E-10
Vinyl Chloride	6.00E-03	4.60E-03	1.01E-02	7.76E-03	1.58E-09	1.21E-09	1.94E-03	3.07E-12	2.35E-12

a. ND = Not Detected

TABLE P-46

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION
FOR ADULTS NEAR SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	2.00E-02	1.00E-02	1.00E+00	3.63E-05	7.27E-07	3.63E-07
Barium	6.00E-01	3.50E-01	5.00E-01	1.82E-05	1.09E-05	6.36E-06
Benzene	ND (a)	ND	1.00E+00	3.63E-05	0.00E+00	0.00E+00
Cadmium	1.40E-01	1.00E-01	8.00E-02	2.91E-06	4.07E-07	2.91E-07
Chromium	2.00E-01	1.00E-01	5.00E-01	1.82E-05	3.63E-06	1.82E-06
4,4' DDT	ND	ND	1.00E+00	3.63E-05	0.00E+00	0.00E+00
1,1 Dichloroethane	3.70E-02	2.04E-02	1.00E+00	3.63E-05	1.34E-06	7.41E-07
1,1 Dichloroethylene	3.50E-02	1.68E-02	1.00E+00	3.63E-05	1.27E-06	6.11E-07
Trans-1,2 Dichloroethylene	8.20E-02	5.41E-02	1.00E+00	3.63E-05	2.98E-06	1.97E-06
Lead	7.60E-01	3.13E-01	1.50E-01	5.45E-06	4.14E-06	1.71E-06
Mercury	ND	ND	7.00E-02	2.54E-06	0.00E+00	0.00E+00
Tetrachloroethylene	1.00E-02	7.30E-03	1.00E+00	3.63E-05	3.63E-07	2.65E-07
1,1,1 Trichloroethane	1.40E+00	6.01E-01	1.00E+00	3.63E-05	5.09E-05	2.18E-05
Trichloroethylene	7.40E-01	3.56E-01	1.00E+00	3.63E-05	2.69E-05	1.29E-05
Vinyl Chloride	6.00E-03	4.60E-03	1.00E+00	3.63E-05	2.18E-07	1.67E-07

a. ND = Not Detected

TABLE P-47

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION FOR CHILDREN NEAR SITE 3

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Arsenic	2.00E-02	1.00E-02	1.00E+00	1.91E-04	3.82E-06	1.91E-06
Barium	6.00E-01	3.50E-01	5.00E-01	9.54E-05	5.72E-05	3.34E-05
Benzene	ND (a)	ND	1.00E+00	1.91E-04	0.00E+00	0.00E+00
Cadmium	1.40E-01	1.00E-01	8.00E-02	1.53E-05	2.14E-06	1.53E-06
Chromium	2.00E-01	1.00E-01	5.00E-01	9.54E-05	1.91E-05	9.54E-06
4,4' DDT	ND	ND	1.00E+00	1.91E-04	0.00E+00	0.00E+00
1,1 Dichloroethane	3.70E-02	2.04E-02	1.00E+00	1.91E-04	7.06E-06	3.89E-06
1,1 Dichloroethylene	3.50E-02	1.68E-02	1.00E+00	1.91E-04	6.68E-06	3.21E-06
Trans-1,2 Dichloroethylene	8.20E-02	5.41E-02	1.00E+00	1.91E-04	1.56E-05	1.03E-05
Lead	7.60E-01	3.13E-01	4.00E-01	7.63E-05	5.80E-05	2.39E-05
Mercury	ND	ND	7.00E-02	1.34E-05	0.00E+00	0.00E+00
Tetrachloroethylene	1.00E-02	7.30E-03	1.00E+00	1.91E-04	1.91E-06	1.39E-06
1,1,1 Trichloroethane	1.40E+00	6.01E-01	1.00E+00	1.91E-04	2.67E-04	1.15E-04
Trichloroethylene	7.40E-01	3.56E-01	1.00E+00	1.91E-04	1.41E-04	6.79E-05
Vinyl Chloride	6.00E-03	4.60E-03	1.00E+00	1.91E-04	1.14E-06	8.78E-07

a. ND = Not Detected

TABLE P-48

FUTURE TOTAL CHRONIC INTAKE
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 3

Indicator Chemical	Ingestion of Soil at Depth (mg/kg/day)		Ingestion of Ground Water (mg/kg/day)		Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	1.01E-07	4.07E-08	1.43E-02	9.04E-03	1.43E-02	9.04E-03
Benzene	0.00E+00	0.00E+00	1.03E-03	2.90E-04	1.03E-03	2.90E-04
Cadmium	1.48E-09	1.21E-09	0.00E+00	0.00E+00	1.48E-09	1.21E-09
Chromium	3.19E-08	2.37E-08	1.01E-02	4.36E-03	1.01E-02	4.36E-03
4,4' DDT	1.85E-10	8.18E-11	0.00E+00	0.00E+00	1.85E-10	8.18E-11
1,1 Dichloroethane	4.19E-13	2.10E-13	8.86E-03	3.16E-03	8.86E-03	3.16E-03
1,1 Dichloroethylene	0.00E+00	0.00E+00	1.66E-03	6.18E-04	1.66E-03	6.18E-04
Trans-1,2 Dichloroethylene	0.00E+00	0.00E+00	1.29E-02	3.53E-03	1.29E-02	3.53E-03
Lead	2.06E-09	1.07E-09	1.29E-04	6.43E-05	1.29E-04	6.43E-05
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethylene	6.88E-13	3.44E-13	2.86E-02	1.16E-02	2.86E-02	1.16E-02
1,1,1 Trichloroethane	0.00E+00	0.00E+00	8.86E-02	3.09E-02	8.86E-02	3.09E-02
Trichloroethylene	6.71E-12	6.29E-11	2.26E-02	2.54E-03	2.26E-02	2.54E-03
Vinyl Chloride	0.00E+00	0.00E+00	2.60E-04	1.42E-04	2.60E-04	1.42E-04

TABLE P-49

FUTURE TOTAL CHRONIC INTAKE
ONSITE CHILD RESIDENTS AT SITE 3

	Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
...icator ...emical	Upper Bound	Best Estimate
Arsenic	0.00E+00	0.00E+00
Barium	1.07E-02	6.78E-03
Benzene	7.71E-04	2.18E-04
Cadmium	0.00E+00	0.00E+00
Chromium	7.61E-03	3.27E-03
4,4' DDT	0.00E+00	0.00E+00
1,1 Dichloroethane	6.64E-03	2.37E-03
1,1 Dichloroethylene	1.24E-03	4.64E-04
Trans-1,2 Dichloroethylene	9.64E-03	2.65E-03
Lead	2.57E-04	1.29E-04
Mercury	0.00E+00	0.00E+00
Tetrachloroethylene	2.14E-02	8.71E-03
1,1,1 Trichloroethane	6.64E-02	2.32E-02
Trichloroethylene	1.69E-02	1.90E-03
Vinyl Chloride	1.95E-04	1.07E-04

TABLE P-50

TOTAL CHRONIC INTAKE FOR WORKERS AT SITE 3
CURRENT

Indicator Chemical	Total Chronic Daily Intakes Oral Route (mg/kg/day)		Total Chronic Daily Intakes Inhalation Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Arsenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	1.01E-07	5.85E-08	0.00E+00	0.00E+00
Benzene	1.51E-09	7.55E-10	0.00E+00	0.00E+00
Cadmium	2.60E-09	1.40E-09	0.00E+00	0.00E+00
Chromium	3.72E-08	2.67E-08	0.00E+00	0.00E+00
4,4' DDT	8.39E-10	1.50E-10	0.00E+00	0.00E+00
1,1 Dichloroethane	3.69E-11	2.26E-11	1.51E-11	8.32E-12
1,1 Dichloroethylene	6.21E-11	3.27E-11	1.44E-11	6.93E-12
Trans-1,2 Dichloroethylene	2.35E-11	1.68E-11	3.38E-11	2.23E-11
Lead	7.62E-09	2.44E-09	0.00E+00	0.00E+00
Mercury	3.29E-11	1.64E-11	0.00E+00	0.00E+00
Tetrachloroethylene	5.03E-09	1.38E-10	3.15E-12	2.30E-12
1,1,1 Trichloroethane	3.52E-10	8.21E-11	4.93E-10	2.11E-10
Trichloroethylene	1.58E-09	3.24E-10	2.62E-10	1.26E-10
Vinyl Chloride	0.00E+00	0.00E+00	3.07E-12	2.35E-12

TABLE P-51

TOTAL CHRONIC INTAKE FOR ADULTS NEAR SITE 3
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)	
	Upper Bound	Best Estimate
Arsenic	7.27E-07	3.63E-07
Barium	1.09E-05	6.36E-06
Benzene	0.00E+00	0.00E+00
Cadmium	4.07E-07	2.91E-07
Chromium	3.63E-06	1.82E-06
4,4' DDT	0.00E+00	0.00E+00
1,1 Dichloroethane	1.34E-06	7.41E-07
1,1 Dichloroethylene	1.27E-06	6.11E-07
Trans-1,2 Dichloroethylene	2.98E-06	1.97E-06
Lead	4.[illegible]E-06	1.71E-06
Mercury	0.00E+00	0.00E+00
Tetrachloroethylene	3.63E-07	2.65E-07
1,1,1 Trichloroethane	5.09E-05	2.18E-05
Trichloroethylene	2.69E-05	1.29E-05
Vinyl Chloride	2.18E-07	1.67E-07

TABLE P-52

TOTAL CHRONIC INTAKE FOR CHILDREN NEAR SITE 3
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)	
	Upper Bound	Best Estimate
Arsenic	3.82E-06	1.91E-06
Barium	5.72E-05	3.34E-05
Benzene	0.00E+00	0.00E+00
Cadmium	2.14E-06	1.53E-06
Chromium	1.91E-05	9.54E-06
4,4' DDT	0.00E+00	0.00E+00
1,1 Dichloroethane	7.06E-06	3.89E-06
1,1 Dichloroethylene	6.68E-06	3.21E-06
Trans-1,2 Dichloroethylene	1.56E-05	1.03E-05
Lead	5.80E-05	2.39E-05
Mercury	0.00E+00	0.00E+00
Tetrachloroethylene	1.91E-06	1.39E-06
1,1,1 Trichloroethane	2.67E-04	1.15E-04
Trichloroethylene	1.41E-04	6.79E-05
Vinyl Chloride	1.14E-06	8.78E-07

TABLE P-53

CHRONIC HAZARD INDEX
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 3
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Barium	1.43E-02	5.10E-02	2.80E-01	9.04E-03	5.10E-02	1.77E-01
Benzene	1.03E-03	NA	0.00E+00	2.90E-04	NA	0.00E+00
Cadmium	1.48E-09	2.90E-04	5.09E-06	1.21E-09	2.90E-04	4.16E-06
Chromium	1.01E-02	5.00E-03	2.03E+00	4.36E-03	5.00E-03	8.71E-01
4,4' DDT	1.85E-10	5.00E-04	3.69E-07	8.18E-11	5.00E-04	1.64E-07
1,1 Dichloroethane	8.86E-03	1.20E-01	7.38E-02	3.16E-03	1.20E-01	2.63E-02
1,1 Dichloroethylene	1.66E-03	9.00E-03	1.84E-01	6.18E-04	9.00E-03	6.87E-02
Trans-1,2 Dichloroethylene	1.29E-02	2.00E-02	6.43E-01	3.53E-03	2.00E-02	1.76E-01
Lead	1.29E-04	NA	0.00E+00	6.43E-05	NA	0.00E+00
Mercury	0.00E+00	2.00E-03	0.00E+00	0.00E+00	2.00E-03	0.00E+00
Tetrachloroethylene	2.86E-02	1.00E-02	2.86E+00	1.16E-02	1.00E-02	1.16E+00
1,1,1 Trichloroethane	8.86E-02	3.00E-01	2.95E-01	3.09E-02	3.00E-01	1.03E-01
Trichloroethylene	2.26E-02	1.30E-02	1.74E+00	2.54E-03	1.30E-02	1.95E-01
Vinyl Chloride	2.60E-04	NA	0.00E+00	1.42E-04	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-54

CHRONIC HAZARD INDEX
ONSITE CHILD RESIDENTS AT SITE 3
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Barium	1.07E-02	5.10E-02	2.10E-01	6.78E-03	5.10E-02	1.33E-01
Benzene	7.71E-04	NA	0.00E+00	2.18E-04	NA	0.00E+00
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chromium	7.61E-03	5.00E-03	1.52E+00	3.27E-03	5.00E-03	6.54E-01
4,4' DDT	0.00E+00	5.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00
1,1 Dichloroethane	6.64E-03	1.20E-01	5.54E-02	2.37E-03	1.20E-01	1.97E-02
1,1 Dichloroethylene	1.24E-03	9.00E-03	1.38E-01	4.64E-04	9.00E-03	5.15E-02
Trans-1,2 Dichloroethylene	9.64E-03	2.00E-02	4.82E-01	2.65E-03	2.00E-02	1.32E-01
Lead	2.57E-04	NA	0.00E+00	1.29E-04	NA	0.00E+00
Mercury	0.00E+00	2.00E-03	0.00E+00	0.00E+00	2.00E-03	0.00E+00
Tetrachloroethylene	2.14E-02	1.00E-02	2.14E+00	8.71E-03	1.00E-02	8.71E-01
1,1,1 Trichloroethane	6.64E-02	3.00E-01	2.21E-01	2.32E-02	3.00E-01	7.73E-02
Trichloroethylene	1.69E-02	1.30E-02	1.30E+00	1.90E-03	1.30E-02	1.46E-01
Vinyl Chloride	1.95E-04	NA	0.00E+00	1.07E-04	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-55

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 3
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation			Ingestion		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Barium	0.00E+00	1.40E-04	0.00E+00	1.01E-07	5.10E-02	1.99E-06
Benzene	0.00E+00	NA	0.00E+00	1.51E-09	NA	0.00E+00
Cadmium	0.00E+00	NA	0.00E+00	2.60E-09	2.90E-04	8.98E-06
Chromium	0.00E+00	NA	0.00E+00	3.72E-08	5.00E-03	7.43E-06
4,4' DDT	0.00E+00	NA	0.00E+00	8.39E-10	5.00E-04	1.68E-06
1,1 Dichloroethane	1.51E-11	1.38E-01	1.09E-10	3.69E-11	1.20E-01	3.08E-10
1,1 Dichloroethylene	1.44E-11	NA	0.00E+00	6.21E-11	9.00E-03	6.90E-09
Trans-1,2 Dichloroethylene	3.38E-11	NA	0.00E+00	2.35E-11	2.00E-02	1.17E-09
Lead	0.00E+00	NA	0.00E+00	7.62E-09	NA	0.00E+00
Mercury	0.00E+00	5.10E-05	0.00E+00	3.29E-11	2.00E-03	1.64E-08
Tetrachloroethylene	3.15E-12	NA	0.00E+00	5.03E-09	1.00E-02	5.03E-07
1,1,1 Trichloroethane	4.93E-10	6.30E+00	7.82E-11	3.52E-10	3.00E-01	1.17E-09
Trichloroethylene	2.62E-10	NA	0.00E+00	1.58E-09	1.30E-02	1.21E-07
Vinyl Chloride	3.07E-12	NA	0.00E+00	0.00E+00	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-56

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 3
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation			Ingestion		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Barium	0.00E+00	1.40E-04	0.00E+00	5.85E-08	5.10E-02	1.15E-06
Benzene	0.00E+00	NA	0.00E+00	7.55E-10	NA	0.00E+00
Cadmium	0.00E+00	NA	0.00E+00	1.40E-09	2.90E-04	4.82E-06
Chromium	0.00E+00	NA	0.00E+00	2.67E-08	5.00E-03	5.34E-06
4,4' DDT	0.00E+00	NA	0.00E+00	1.50E-10	5.00E-04	3.00E-07
1,1 Dichloroethane	8.32E-12	1.38E-01	6.03E-11	2.26E-11	1.20E-01	1.89E-10
1,1 Dichloroethylene	6.93E-12	NA	0.00E+00	3.27E-11	9.00E-03	3.63E-09
Trans-1,2 Dichloroethylene	2.23E-11	NA	0.00E+00	1.68E-11	2.00E-02	8.39E-10
Lead	0.00E+00	NA	0.00E+00	2.44E-09	NA	0.00E+00
Mercury	0.00E+00	5.10E-05	0.00E+00	1.64E-11	2.00E-03	8.22E-09
Tetrachloroethylene	2.30E-12	NA	0.00E+00	1.38E-10	1.00E-02	1.38E-08
1,1,1 Trichloroethane	2.11E-10	6.30E+00	3.36E-11	8.21E-11	3.00E-01	2.74E-10
Trichloroethylene	1.26E-10	NA	0.00E+00	3.24E-10	1.30E-02	2.49E-08
Vinyl Chloride	2.35E-12	NA	0.00E+00	0.00E+00	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-57

CHRONIC HAZARD INDEX FOR ADULTS NEAR SITE 3
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	7.27E-07	NA (c)	0.00E+00	3.63E-07	NA	0.00E+00
Barium	1.09E-05	5.10E-02	2.14E-04	6.36E-06	5.10E-02	1.25E-04
Benzene	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Cadmium	4.07E-07	2.90E-04	1.40E-03	2.91E-07	2.90E-04	1.00E-03
Chromium	3.63E-06	5.00E-03	7.27E-04	1.82E-06	5.00E-03	3.63E-04
4,4' DDT	0.00E+00	5.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00
1,1 Dichloroethane	1.34E-06	1.20E-01	1.12E-05	7.41E-07	1.20E-01	6.18E-06
1,1 Dichloroethylene	1.27E-06	9.00E-03	1.41E-04	6.11E-07	9.00E-03	6.79E-05
Trans-1,2 Dichloroethylene	2.98E-06	2.00E-02	1.49E-04	1.97E-06	2.00E-02	9.83E-05
Lead	4.14E-06	NA	0.00E+00	1.71E-06	NA	0.00E+00
Mercury	0.00E+00	2.00E-03	0.00E+00	0.00E+00	2.00E-03	0.00E+00
Tetrachloroethylene	3.63E-07	1.00E-02	3.63E-05	2.65E-07	1.00E-02	2.65E-05
1,1,1 Trichloroethane	5.09E-05	3.00E-01	1.70E-04	2.18E-05	3.00E-01	7.28E-05
Trichloroethylene	2.69E-05	1.30E-02	2.07E-03	1.29E-05	1.30E-02	9.95E-04
Vinyl Chloride	2.18E-07	NA	0.00E+00	1.67E-07	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-58

CHRONIC HAZARD INDEX FOR CHILDREN NEAR SITE 3
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Arsenic	3.82E-06	NA (c)	0.00E+00	1.91E-06	NA	0.00E+00
Barium	5.72E-05	5.10E-02	1.12E-03	3.34E-05	5.10E-02	6.55E-04
Benzene	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Cadmium	2.14E-06	2.90E-04	7.37E-03	1.53E-06	2.90E-04	5.26E-03
Chromium	1.91E-05	5.00E-03	3.82E-03	9.54E-06	5.00E-03	1.91E-03
4,4' DDT	0.00E+00	5.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00
1,1 Dichloroethane	7.06E-06	1.20E-01	5.88E-05	3.89E-06	1.20E-01	3.24E-05
1,1 Dichloroethylene	6.68E-06	9.00E-03	7.42E-04	3.21E-06	9.00E-03	3.56E-04
Trans-1,2 Dichloroethylene	1.56E-05	2.00E-02	7.82E-04	1.03E-05	2.00E-02	5.16E-04
Lead	5.80E-05	NA	0.00E+00	2.39E-05	NA	0.00E+00
Mercury	0.00E+00	2.00E-03	0.00E+00	0.00E+00	2.00E-03	0.00E+00
Tetrachloroethylene	1.91E-06	1.00E-02	1.91E-04	1.39E-06	1.00E-02	1.39E-04
1,1,1 Trichloroethane	2.67E-04	3.00E-01	8.90E-04	1.15E-04	3.00E-01	3.82E-04
Trichloroethylene	1.41E-04	1.30E-02	1.09E-02	6.79E-05	1.30E-02	5.23E-03
Vinyl Chloride	1.14E-06	NA	0.00E+00	8.78E-07	NA	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-59

RISK FROM POTENTIAL CARCINOGENS
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 3
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	0.00E+00	1.50E+01	0.00E+00	0.00E+00	1.50E+01	0.00E+00
Barium	1.43E-02	- (b)	0.00E+00	9.04E-03	-	0.00E+00
Benzene	1.03E-03	2.90E-02	2.98E-05	2.90E-04	2.90E-02	8.42E-06
Cadmium	1.48E-09	NA	0.00E+00	1.21E-09	NA (c)	0.00E+00
Chromium	1.01E-02	NA	0.00E+00	4.36E-03	NA	0.00E+00
4,4' DDT	1.85E-10	3.40E-01	6.27E-11	8.18E-11	3.40E-01	2.78E-11
1,1 Dichloroethane	8.86E-03	-	0.00E+00	3.16E-03	-	0.00E+00
1,1 Dichloroethylene	1.66E-03	6.00E-01	9.94E-04	6.18E-04	6.00E-01	3.71E-04
Trans-1,2 Dichloroethylene	1.29E-02	-	0.00E+00	3.53E-03	-	0.00E+00
Lead	1.29E-04	NA	0.00E+00	6.43E-05	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Tetrachloroethylene	2.86E-02	-	0.00E+00	1.16E-02	-	0.00E+00
1,1,1 Trichloroethane	8.86E-02	-	0.00E+00	3.09E-02	-	0.00E+00
Trichloroethylene	2.26E-02	1.10E-02	2.48E-04	2.54E-03	1.10E-02	2.79E-05
Vinyl Chloride	2.60E-04	2.30E+00	5.98E-04	1.42E-04	2.30E+00	3.27E-04

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-60

RISK FROM POTENTIAL CARCINOGENS
ONSITE CHILD RESIDENTS AT SITE 3
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	0.00E+00	1.50E+01	0.00E+00	0.00E+00	1.50E+01	0.00E+00
Barium	1.07E-02	- (b)	0.00E+00	6.78E-03	-	0.00E+00
Benzene	7.71E-04	2.90E-02	2.24E-05	2.18E-04	2.90E-02	6.31E-06
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Chromium	7.61E-03	NA	0.00E+00	3.27E-03	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	0.00E+00	3.40E-01	0.00E+00
1,1 Dichloroethane	6.64E-03	-	0.00E+00	2.37E-03	-	0.00E+00
1,1 Dichloroethylene	1.24E-03	6.00E-01	7.46E-04	4.64E-04	6.00E-01	2.78E-04
Trans-1,2 Dichloroethylene	9.64E-03	-	0.00E+00	2.65E-03	-	0.00E+00
Lead	2.57E-04	NA	0.00E+00	1.29E-04	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Tetrachloroethylene	2.14E-02	-	0.00E+00	8.71E-03	-	0.00E+00
1,1,1 Trichloroethane	6.64E-02	-	0.00E+00	2.32E-02	-	0.00E+00
Trichloroethylene	1.69E-02	1.10E-02	1.86E-04	1.90E-03	1.10E-02	2.09E-05
Vinyl Chloride	1.95E-04	2.30E+00	4.49E-04	1.07E-04	2.30E+00	2.45E-04

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-61

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 3
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation			Ingestion		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	0.00E+00	5.00E+01	0.00E+00	0.00E+00	1.50E+01	0.00E+00
Barium	0.00E+00	- (b)	0.00E+00	1.01E-07	-	0.00E+00
Benzene	0.00E+00	2.90E-02	0.00E+00	1.51E-09	2.90E-02	4.38E-11
Cadmium	0.00E+00	6.10E+00	0.00E+00	2.60E-09	NA (c)	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00	3.72E-08	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	8.39E-10	3.40E-01	2.85E-10
1,1 Dichloroethane	1.51E-11	-	0.00E+00	3.69E-11	-	0.00E+00
1,1 Dichloroethylene	1.44E-11	1.16E+00	1.67E-11	6.21E-11	6.00E-01	3.72E-11
Trans-1,2 Dichloroethylene	3.38E-11	-	0.00E+00	2.35E-11	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	7.62E-09	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	3.29E-11	-	0.00E+00
Tetrachloroethylene	3.15E-12	-	0.00E+00	5.03E-09	-	0.00E+00
1,1,1 Trichloroethane	4.93E-10	-	0.00E+00	3.52E-10	-	0.00E+00
Trichloroethylene	2.62E-10	NA	0.00E+00	1.58E-09	1.10E-02	1.73E-11
Vinyl Chloride	3.07E-12	2.50E-02	7.67E-14	0.00E+00	2.30E+00	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-62

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 3
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation			Ingestion		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	0.00E+00	5.00E+01	0.00E+00	0.00E+00	1.50E+01	0.00E+00
Barium	0.00E+00	- (b)	0.00E+00	5.85E-08	-	0.00E+00
Benzene	0.00E+00	2.90E-02	0.00E+00	7.55E-10	2.90E-02	2.19E-11
Cadmium	0.00E+00	6.10E+00	0.00E+00	1.40E-09	NA (c)	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00	2.67E-08	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	1.50E-10	3.40E-01	5.10E-11
1,1 Dichloroethane	8.32E-12	-	0.00E+00	2.26E-11	-	0.00E+00
1,1 Dichloroethylene	6.93E-12	1.16E+00	8.04E-12	3.27E-11	6.00E-01	1.96E-11
Trans-1,2 Dichloroethylene	2.23E-11	-	0.00E+00	1.68E-11	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	2.44E-09	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	1.64E-11	-	0.00E+00
Tetrachloroethylene	2.30E-12	-	0.00E+00	1.38E-10	-	0.00E+00
1,1,1 Trichloroethane	2.11E-10	-	0.00E+00	8.21E-11	-	0.00E+00
Trichloroethylene	1.26E-10	NA	0.00E+00	3.24E-10	1.10E-02	3.56E-12
Vinyl Chloride	2.35E-12	2.50E-02	5.88E-14	0.00E+00	2.30E+00	0.00E+00

a. CDI = Chronic Daily Intake

b. Not applicable to this compound.

c. NA = Data not available.

TABLE P-63

RISK FROM POTENTIAL CARCINOGENS FOR ADULTS NEAR SITE 3
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	7.27E-07	1.50E+01	1.09E-05	3.63E-07	1.50E+01	5.45E-06
Barium	1.09E-05	- (b)	0.00E+00	6.36E-06	-	0.00E+00
Benzene	0.00E+00	2.90E-02	0.00E+00	0.00E+00	2.90E-02	0.00E+00
Cadmium	4.07E-07	NA (c)	0.00E+00	2.91E-07	NA	0.00E+00
Chromium	3.63E-06	NA	0.00E+00	1.82E-06	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	0.00E+00	3.40E-01	0.00E+00
1,1 Dichloroethane	1.34E-06	-	0.00E+00	7.41E-07	-	0.00E+00
1,1 Dichloroethylene	1.27E-06	6.00E-01	7.63E-07	6.11E-07	6.00E-01	3.67E-07
Trans-1,2 Dichloroethylene	2.98E-06	-	0.00E+00	1.97E-06	-	0.00E+00
Lead	4.14E-06	NA	0.00E+00	1.71E-06	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Tetrachloroethylene	3.63E-07	-	0.00E+00	2.65E-07	-	0.00E+00
1,1,1 Trichloroethane	5.09E-05	-	0.00E+00	2.18E-05	-	0.00E+00
Trichloroethylene	2.69E-05	1.10E-02	2.96E-07	1.29E-05	1.10E-02	1.42E-07
Vinyl Chloride	2.18E-07	2.30E+00	5.02E-07	1.67E-07	2.30E+00	3.85E-07

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-64

RISK FROM POTENTIAL CARCINOGENS FOR CHILDREN NEAR SITE 3
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Arsenic	3.82E-06	1.50E+01	5.72E-05	1.91E-06	1.50E+01	2.86E-05
Barium	5.72E-05	- (b)	0.00E+00	3.34E-05	-	0.00E+00
Benzene	0.00E+00	2.90E-02	0.00E+00	0.00E+00	2.90E-02	0.00E+00
Cadmium	2.14E-06	NA (c)	0.00E+00	1.53E-06	NA	0.00E+00
Chromium	1.91E-05	NA	0.00E+00	9.54E-06	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	0.00E+00	3.40E-01	0.00E+00
1,1 Dichloroethane	7.06E-06	-	0.00E+00	3.89E-06	-	0.00E+00
1,1 Dichloroethylene	6.68E-06	6.00E-01	4.01E-06	3.21E-06	6.00E-01	1.93E-06
Trans-1,2 Dichloroethylene	1.56E-05	-	0.00E+00	1.03E-05	-	0.00E+00
Lead	5.80E-05	NA	0.00E+00	2.39E-05	NA	0.00E+00
Mercury	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Tetrachloroethylene	1.91E-06	-	0.00E+00	1.39E-06	-	0.00E+00
1,1,1 Trichloroethane	2.67E-04	-	0.00E+00	1.15E-04	-	0.00E+00
Trichloroethylene	1.41E-04	1.10E-02	1.55E-06	6.79E-05	1.10E-02	7.47E-07
Vinyl Chloride	1.14E-06	2.30E+00	2.63E-06	8.79E-07	2.30E+00	2.02E-06

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

SECTION P.4

SITE 4 RISK ASSESSMENT TABLES

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SECTION P.4
SITE 4 RISK ASSESSMENT TABLES

This section contains the risk assessment worksheets for Site 4.

P.4.1 Site 4 Indicator Chemical Selection

Data used in the selection of indicator chemicals were compiled from both the Remedial Investigation performed at the Base by ES in 1988 and the 1986 Phase II Stage 2 study (Dames & Moore, 1987). These data are summarized in Table P-65, while Tables P-66 through P-69 step through the USEPA selection process.

P.4.2 Site 4 Estimation of Chemical Intake for Each Pathway

Tables P-70 through P-78 summarize the upper bound and best estimate chronic daily intakes from each potential pathway for each population at risk, as calculated from the maximum and average indicator chemical concentrations, respectively.

P.4.3 Site 4 Estimation of Total Chemical Intake for Each Exposure Route

Chronic daily intakes for pathways categorized as oral, dermal or inhalation routes were summed to yield total chronic daily intake via a particular route for a target population. Tables P-79 through P-83 present the total chemical intake for each exposure route.

P.4.4 Site 4 Characterization of Risk From Noncarcinogens

Tables P-84 through P-89 present the chronic hazard index values for each target population.

P.4.5 Site 4 Characterization of Risk From Potential Carcinogens

Tables P-90 through P-95 present the risk from potential carcinogens for each target population.

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TABLE P-65

MAXIMUM AND REPRESENTATIVE CHEMICAL CONCENTRATIONS AT SITE 4

Parameter	CAS (a) Number	Ground Water (mg/L)			Surface Water (mg/L)			Sediment (mg/kg)			Soils at 0 to 2 Feet (mg/kg)			Soils Below 2 Feet (mg/kg)		
		Maximum Value	Representative Value	# Detected/ # Analyzed	Maximum Value	Representative Value	# Detected/ # Analyzed	Maximum Value	Representative Value	# Detected/ # Analyzed	Maximum Value	Representative Value	# Detected/ # Analyzed	Maximum Value	Representative Value	# Detected/ # Analyzed
Barium	7440-39-3	1.70E-01	1.30E-01	7/13	ND (b)	ND	0/7	8.37E-02	5.54E-02	7/7	9.17E-02	6.24E-02	6/6	8.56E-02	5.20E-02	9/9
Benzene	71-43-2	2.20E-02	1.26E-02	2/17	9.30E-01	2.23E-01	8/11	1.60E+01	4.64E+00	4/11	ND	ND	0/6	6.20E+00	2.09E+00	3/27
Cadmium	7740-43-9	3.10E-03	2.80E-03	2/13	ND	ND	0/7	1.30E-03	6.50E-04	1/7	1.57E-02	7.70E-03	6/6	8.56E-02	5.20E-02	9/9
Chlorobenzene	108-90-7	ND	ND	0/21	2.20E-03	1.89E-03	4/15	ND	ND	0/7	ND	ND	0/6	ND	ND	0/9
Chromium	7440-47-3	3.90E-03	2.74E-03	7/13	ND	ND	0/7	2.34E-02	1.53E-02	7/7	4.97E-02	2.90E-02	6/6	4.93E-02	3.21E-02	9/9
Trans-1,2 Dichloroethylene	540-59-0	5.80E-03	2.60E-03	1/17	5.30E-03	3.56E-03	5/11	ND	ND	0/11	ND	ND	0/6	ND	ND	0/27
Ethyl Benzene	100-41-4	ND	ND	0/13	1.50E-01	5.91E-02	4/7	4.00E+02	1.00E+02	5/11	ND	ND	0/6	1.20E+01	6.00E+00	1/27
Lead	7439-92-1	ND	ND	0/13	ND	ND	0/7	2.31E-02	1.37E-02	7/7	2.16E-02	8.00E-03	6/6	7.30E-03	4.09E-03	9/9
Toluene	108-88-3	ND	ND	0/17	2.30E-02	9.77E-03	3/11	5.40E+01	1.78E+01	8/11	3.30E-01	1.23E-01	4/6	2.50E+01	2.72E+00	13/27
1,1,1 Trichloroethane	71-55-6	ND	ND	0/17	1.90E-02	1.45E-02	2/11	ND	ND	0/11	ND	ND	0/6	ND	ND	0/27
Trichloroethylene	79-01-6	ND	ND	0/17	2.20E-02	8.23E-03	6/11	ND	ND	0/11	ND	ND	0/6	ND	ND	0/27
Xylenes	1330-20-7	2.70E-03	1.35E-03	1/17	1.02E+00	4.31E-01	5/11	6.90E+02	1.27E+02	8/11	ND	ND	0/6	3.15E+02	7.71E+01	5/27

a. CAS = Chemical Abstracts Service
b. ND = Not Detected

Source: Engineering-Science, Inc. and Dames & Moore (1987)

TABLE P-66

TOXICITY DATA FOR COMPOUNDS DETECTED AT SITE 4

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	Water (wT) (e) (L/mg)	Soil (sT) (f) (kg/mg)	Water (wT) (L/mg)	Soil (sT) (kg/mg)
Barium	7440-39-3	NC (g)	10	10	D	D	4.08E+00	2.04E-04	- (h)	-
Benzene	71-43-2	NC, PC (i)	5	10	A	A	1.17E-01	5.85E-06	7.71E-03	3.86E-07
Cadmium	7740-43-9	NC, PC	-	8	NA (j)	B1	NA	NA	NA	NA
Chlorobenzene	108-90-7	NC	4	1	D	D	1.43E-01	7.14E-06	-	-
Chromium	7440-47-3	NC, PC	NA	NA	NA	A	NA	NA	NA	NA
Trans-1,2 Dichloroethylene	540-59-0	NC	5	5	D	D	5.29E-02	2.65E-06	-	-
Ethyl Benzene	100-41-4	NC	4	4	D	D	1.10E-02	5.52E-07	-	-
Lead	7439-92-1	NC, PC	10	10	B2	B2	8.93E-01	4.46E-05	-	-
Toluene	108-88-3	NC	7	10	D	D	5.20E-03	2.60E-07	-	-
1,1,1 Trichloroethane	71-55-6	NC	2	2	D	D	7.33E-04	3.67E-08	-	-
Trichloroethylene	79-01-6	NC, PC	5	4	B2	B2	1.05E+00	5.26E-05	4.29E-03	2.14E-07
Xylenes	1330-20-7	NC	8	8	D	D	1.07E-01	5.33E-06	-	-

a. CAS = Chemical Abstracts Service
b. Rating Value = RVe = USEPA health effect rating value for noncarinogens
c. Carcinogen Assessment Group = CAG = USEPA classification of carcinogenicity
d. Toxicity Constant = USEPA potency factor based on either carcinogenic or noncarcinogenic endpoints for a given medium
e. wT = Water toxicity constant
f. sT = Soil toxicity constant
g. NC = Noncarcinogenic effects
h. Not applicable to parameter
i. PC = Potential Carcinogen
j. ND = No data available

Source: U.S Environmental Protection Agency (1986a)

TABLE P-67

CT VALUES FOR NONCARCINOGENIC COMPOUNDS DETECTED AT SITE 4

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Barium	7440-39-3	6.94E-01	5.30E-01	0.00E+00	0.00E+00	1.71E-05	1.13E-05	1.87E-05	1.27E-05	1.75E-05	1.06E-05
Benzene	71-43-2	2.57E-03	1.47E-03	1.09E-01	2.61E-02	9.36E-05	2.71E-05	0.00E+00	0.00E+00	3.63E-05	1.22E-05
Cadmium	7740-43-9	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	3.15E-04	2.71E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
Trans-1,2 Dichloroethylene	540-59-0	3.07E-04	1.38E-04	2.80E-04	1.88E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	1.65E-03	6.50E-04	2.21E-04	5.52E-05	0.00E+00	0.00E+00	6.62E-06	3.31E-06
Lead	7439-92-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-06	6.13E-07	9.63E-07	3.57E-07	3.26E-07	1.82E-07
Toluene	108-88-3	0.00E+00	0.00E+00	1.20E-04	5.08E-05	1.40E-05	4.63E-06	8.58E-08	3.19E-08	6.50E-06	7.08E-07
1,1,1 Trichloroethane	71-55-6	0.00E+00	0.00E+00	1.39E-05	1.06E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	0.00E+00	0.00E+00	2.31E-02	8.64E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	2.89E-04	1.44E-04	1.09E-01	4.62E-02	3.68E-03	6.77E-04	0.00E+00	0.00E+00	1.68E-03	4.11E-04

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-68

CT VALUES FOR POTENTIALLY CARCINOGENIC COMPOUNDS DETECTED AT SITE 4

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Barium	7440-39-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	71-43-2	1.70E-04	9.71E-05	7.17E-03	1.72E-03	6.18E-06	1.79E-06	0.00E+00	0.00E+00	2.39E-06	8.07E-07
Cadmium	7740-43-9	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
Trans-1,2 Dichloroethylene	540-59-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	100-41-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	7439-92-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	108-88-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,1 Trichloroethane	71-55-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	79-01-6	0.00E+00	0.00E+00	9.44E-05	3.53E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-69

INDICATOR SCORES AND TENTATIVE RANKING FOR COMPOUNDS DETECTED AT SITE 4

Parameter	CAS (a) Number	Indicator Score for Noncarcinogenic Effects		Tentative Rank for Noncarcinogenic Effects		Indicator Score for Potential Carcinogens		Tentative Rank for Potential Carcinogens	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Barium	7440-39-3	7.47E-01	5.65E-01	1	1				
Benzene	71-43-2	1.09E-01	2.62E-02	3	3	7.18E-03	1.72E-03	1	1
Cadmium	7740-43-9								
Chlorobenzene	108-90-7	3.15E-04	2.71E-04	7	7				
Chromium	7440-47-3								
Trans-1,2 Dichloroethylene	540-59-0	3.07E-04	1.88E-04	8	8				
Ethyl Benzene	100-41-4	1.88E-03	7.09E-04	6	6				
Lead	7439-92-1	2.32E-03	1.15E-03	5	5				
Toluene	108-88-3	1.40E-04	5.61E-05	9	9				
1,1,1 Trichloroethane	71-55-6	1.39E-05	1.06E-05	10	10				
Trichloroethylene	79-01-6	2.31E-02	8.64E-03	4	4	9.44E-05	3.53E-05	2	2
Xylenes	1330-20-7	1.14E-01	4.72E-02	2	2				

TABLE P-70

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER FOR ADULT ONSITE RESIDENTS OR WORKERS AT SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	1.70E-01	1.30E-01	5.00E-01	1.43E-02	2.43E-03	1.86E-03
Benzene	2.20E-02	1.26E-02	1.00E+00	2.86E-02	6.29E-04	3.60E-04
Cadmium	3.10E-03	2.80E-03	8.00E-02	2.29E-03	7.09E-06	6.40E-06
Chlorobenzene	ND (a)	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Chromium	3.90E-03	2.74E-03	5.00E-01	1.43E-02	5.57E-05	3.92E-05
Trans-1,2 Dichloroethylene	5.80E-03	2.60E-03	1.00E+00	2.86E-02	1.66E-04	7.43E-05
Ethyl Benzene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Lead	ND	ND	4.00E-01	1.14E-02	0.00E+00	0.00E+00
Toluene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
1,1,1 Trichloroethane	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Trichloroethylene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Xylenes	2.70E-03	1.35E-03	1.00E+00	2.86E-02	7.71E-05	3.86E-05

a. ND = Not Detected

TABLE P-71

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER
FOR ONSITE CHILD RESIDENTS AT SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	1.70E-01	1.30E-01	5.00E-01	1.07E-02	1.82E-03	1.39E-03
Benzene	2.20E-02	1.26E-02	1.00E+00	2.14E-02	4.71E-04	2.70E-04
Cadmium	3.10E-03	2.80E-03	8.00E-02	1.71E-03	5.31E-06	4.80E-06
Chlorobenzene	ND (a)	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Chromium	3.90E-03	2.74E-03	5.00E-01	1.07E-02	4.18E-05	2.94E-05
Trans-1,2 Dichloroethylene	5.80E-03	2.60E-03	1.00E+00	2.14E-02	1.24E-04	5.57E-05
Ethyl Benzene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Lead	ND	ND	4.00E-01	8.57E-03	0.00E+00	0.00E+00
Toluene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
1,1,1 Trichloroethane	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Trichloroethylene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Xylenes	2.70E-03	1.35E-03	1.00E+00	2.14E-02	5.79E-05	2.89E-05

a. ND = Not Detected

TABLE P-72

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF SOIL AT DEPTH
FOR WORKERS AT SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	8.56E+01	5.20E+01	5.00E-01	8.39E-10	7.18E-08	4.36E-08
Benzene	6.20E+00	2.09E+00	1.00E+00	1.68E-09	1.04E-08	3.51E-09
Cadmium	1.15E+01	1.01E+01	8.00E-02	1.34E-10	1.54E-09	1.36E-09
Chlorobenzene	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Chromium	4.93E+01	3.21E+01	5.00E-01	8.39E-10	4.13E-08	2.70E-08
Trans-1,2 Dichlcroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Ethyl Benzene	1.20E+01	6.00E+00	1.00E+00	1.68E-09	2.01E-08	1.01E-08
Lead	7.30E+00	4.09E+00	1.50E-01	2.52E-10	1.84E-09	1.03E-09
Toluene	2.50E+01	2.72E+00	1.00E+00	1.68E-09	4.19E-08	4.57E-09
1,1,1 Trichloroethane	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Xylenes	3.15E+02	7.71E+01	1.00E+00	1.68E-09	5.28E-07	1.29E-07

a. ND = Not Detected

TABLE P-73

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR WORKERS AT SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	9.17E+01	6.24E+01	5.00E-01	8.39E-10	7.69E-08	5.23E-08
Benzene	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Cadmium	1.57E+01	7.70E+00	8.00E-02	1.34E-10	2.11E-09	1.03E-09
Chlorobenzene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Chromium	4.97E+01	2.99E+01	5.00E-01	8.39E-10	4.17E-08	2.51E-08
Trans-1,2 Dichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Ethyl Benzene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Lead	2.16E+01	8.00E+00	1.50E-01	2.52E-10	5.43E-09	2.01E-09
Toluene	3.30E-01	1.23E-01	1.00E+00	1.68E-09	5.54E-10	2.06E-10
1,1,1 Trichloroethane	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Trichloroethylene	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Xylenes	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-74

CURRENT EXPOSURE POINT INTAKE VIA VOLATILIZATION OF SURFACE WATER
FOR WORKERS AT SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Emission Rate From Water Surface (mg/hr)		Exposure Point Concentration (mg/m3)		Human Intake Factor (m3/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative	Upper Bound	Best Estimat	Upper Bound	Best Estimate		Upper Bound	Best Estimate
Barium	ND (a)	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Benzene	9.30E-01	2.23E-01	1.41E+00	3.38E-01	2.46E-07	5.91E-08	1.94E-03	4.79E-10	1.15E-10
Cadmium	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Chlorobenzene	2.20E-03	1.89E-03	2.77E-03	2.39E-03	4.84E-10	4.17E-10	1.94E-03	9.41E-13	8.10E-13
Chromium	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	5.30E-03	3.56E-03	7.21E-03	4.84E-03	1.26E-09	8.45E-10	1.94E-03	2.45E-12	1.64E-12
Ethyl Benzene	1.50E-01	5.91E-02	1.95E-01	7.69E-02	3.41E-08	1.34E-08	1.94E-03	6.62E-11	2.61E-11
Lead	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	0.00E+00	0.00E+00
Toluene	2.30E-02	9.77E-03	3.21E-02	1.36E-02	5.61E-09	2.38E-09	1.94E-03	1.09E-11	4.63E-12
1,1,1 Trichloroethane	1.90E-02	1.45E-02	2.21E-02	1.68E-02	3.85E-09	2.94E-09	1.94E-03	7.49E-12	5.71E-12
Trichloroethylene	2.20E-02	8.23E-03	2.57E-02	9.63E-03	4.50E-09	1.68E-09	1.94E-03	8.74E-12	3.27E-12
Xylenes	1.02E+00	4.31E-01	1.33E+00	5.61E-01	2.32E-07	9.80E-08	1.94E-03	4.50E-10	1.90E-10

a. ND = Not Detected

TABLE P-75

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION FOR ADULTS NEAR SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	ND (a)	ND	5.00E-01	1.82E-05	0.00E+00	0.00E+00
Benzene	9.30E-01	2.23E-01	1.00E+00	3.63E-05	3.38E-05	8.11E-06
Cadmium	ND	ND	8.00E-02	2.91E-06	0.00E+00	0.00E+00
Chlorobenzene	2.20E-03	1.89E-03	1.00E+00	3.63E-05	8.00E-08	6.89E-08
Chromium	ND	ND	5.00E-01	1.82E-05	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	5.30E-03	3.56E-03	1.00E+00	3.63E-05	1.93E-07	1.29E-07
Ethyl Benzene	1.50E-01	5.91E-02	1.00E+00	3.63E-05	5.45E-06	2.15E-06
Lead	ND	ND	4.00E-01	1.45E-05	0.00E+00	0.00E+00
Toluene	2.30E-02	9.77E-03	1.00E+00	3.63E-05	8.36E-07	3.55E-07
1,1,1 Trichloroethane	1.90E-02	1.45E-02	1.00E+00	3.63E-05	6.91E-07	5.27E-07
Trichloroethylene	2.20E-02	8.23E-03	1.00E+00	3.63E-05	8.00E-07	2.99E-07
Xylenes	1.02E+00	4.31E-01	1.00E+00	3.63E-05	3.71E-05	1.57E-05

a. ND = Not Detected

TABLE P-76

CURRENT EXPOSURE POINT INTAKE VIA DERMAL CONTACT WITH SURFACE WATER DURING RECREATION FOR ADULTS NEAR SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Permeability Constant (cm/hr)	Exposed Skin Area (cm2)	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative				Upper Bound	Best Estimate
Barium	ND (a)	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Benzene	9.30E-01	2.23E-01	4.10E-01	1.82E+04	5.41E-03	5.03E-03	1.21E-03
Cadmium	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	2.20E-03	1.89E-03	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Chromium	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	5.30E-03	3.56E-03	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	1.50E-01	5.91E-02	1.00E-03	1.82E+04	1.32E-05	1.98E-06	7.80E-07
Lead	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Toluene	2.30E-02	9.77E-03	9.00E-04	1.82E+04	1.19E-05	2.73E-07	1.16E-07
1,1,1 Trichloroethane	1.90E-02	1.45E-02	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	2.20E-02	8.23E-03	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Xylenes	1.02E+00	4.31E-01	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-77

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION
FOR CHILDREN NEAR SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	ND (a)	ND	5.00E-01	9.54E-05	0.00E+00	0.00E+00
Benzene	9.30E-01	2.23E-01	1.00E+00	1.91E-04	1.77E-04	4.26E-05
Cadmium	ND	ND	8.00E-02	1.53E-05	0.00E+00	0.00E+00
Chlorobenzene	2.20E-03	1.89E-03	1.00E+00	1.91E-04	4.20E-07	3.62E-07
Chromium	ND	ND	5.00E-01	9.54E-05	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	5.30E-03	3.56E-03	1.00E+00	1.91E-04	1.01E-06	6.79E-07
Ethyl Benzene	1.50E-01	5.91E-02	1.00E+00	1.91E-04	2.86E-05	1.13E-05
Lead	ND	ND	4.00E-01	7.63E-05	0.00E+00	0.00E+00
Toluene	2.30E-02	9.77E-03	1.00E+00	1.91E-04	4.39E-06	1.86E-06
1,1,1 Trichloroethane	1.90E-02	1.45E-02	1.00E+00	1.91E-04	3.63E-06	2.77E-06
Trichloroethylene	2.20E-02	8.23E-03	1.00E+00	1.91E-04	4.20E-06	1.57E-06
Xylenes	1.02E+00	4.31E-01	1.00E+00	1.91E-04	1.95E-04	8.23E-05

a. ND = Not Detected

TABLE P-78

CURRENT EXPOSURE POINT INTAKE VIA DERMAL CONTACT WITH SURFACE WATER DURING RECREATION
FOR CHILDREN NEAR SITE 4

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Permeability Constant (cm/hr)	Exposed Skin Area (cm2)	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative				Upper Bound	Best Estimate
Barium	ND (a)	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Benzene	9.30E-01	2.23E-01	4.10E-01	9.40E+03	1.47E-02	1.37E-02	3.28E-03
Cadmium	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	2.20E-03	1.89E-03	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Chromium	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	5.30E-03	3.56E-03	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Ethyl Benzene	1.50E-01	5.91E-02	1.00E-03	9.40E+03	3.59E-05	5.38E-06	2.12E-06
Lead	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Toluene	2.3[illegible]	9.77E-03	9.00E-04	9.40E+03	3.23E-05	7.43E-07	3.15E-07
1,1,1 Trichloroethane	1.90E-[illegible]	1.45E-02	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	2.20E-0[illegible]	9.23E-03	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Xylenes	1.02E+00	[illegible]-01	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00

a. ND = No Detected

TABLE P-79

FUTURE TOTAL CHRONIC INTAKE
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 4

Indicator Chemical	Ingestion of Soil at Depth (mg/kg/day)		Ingestion of Ground Water (mg/kg/day)		Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	7.18E-08	4.36E-08	2.43E-03	1.86E-03	2.43E-03	1.86E-03
Benzene	1.04E-08	3.51E-09	6.29E-04	3.60E-04	6.29E-04	3.60E-04
Cadmium	1.54E-09	1.36E-09	7.09E-06	6.40E-06	7.09E-06	6.40E-06
Chlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	4.13E-08	2.70E-08	5.57E-05	3.92E-05	5.58E-05	3.92E-05
Trans-1,2 Dichloroethylene	0.00E+00	0.00E+00	1.66E-04	7.43E-05	1.66E-04	7.43E-05
Ethyl Benzene	2.01E-08	1.01E-08	0.00E+00	0.00E+00	2.01E-08	1.01E-08
Lead	1.84E-09	1.03E-09	0.00E+00	0.00E+00	1.84E-09	1.03E-09
Toluene	4.19E-08	4.57E-09	0.00E+00	0.00E+00	4.19E-08	4.57E-09
1,1,1 Trichloroethane	0.00E+C0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xylenes	5.28E-07	1.29E-07	7.71E-05	3.86E-05	7.77E-05	3.87E-05

TABLE P-80

FUTURE TOTAL CHRONIC INTAKE
ONSITE CHILD RESIDENTS AT SITE 4

Indicator Chemical	Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate
Barium	1.82E-03	1.39E-03
Benzene	4.71E-04	2.70E-04
Cadmium	5.31E-06	4.80E-06
Chlorobenzene	0.00E+00	0.00E+00
Chromium	4.18E-05	2.94E-05
Trans-1,2 Dichloroethylene	1.24E-04	5.57E-05
Ethyl Benzene	0.00E+00	0.00E+00
Lead	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
1,1,1 Trichloroethane	0.00E+00	0.00E+00
Trichloroethylene	0.00E+00	0.00E+00
Xylenes	5.79E-05	2.89E-05

TABLE P-81

TOTAL CHRONIC INTAKE FOR WORKERS AT SITE 4
CURRENT

Indicator Chemical	Total Chronic Daily Intakes Oral Route (mg/kg/day) Upper Bound	Total Chronic Daily Intakes Oral Route (mg/kg/day) Best Estimate	Total Chronic Daily Intakes Inhalation Route (mg/kg/day) Upper Bound	Total Chronic Daily Intakes Inhalation Route (mg/kg/day) Best Estimate
Barium	7.69E-08	5.23E-08	0.00E+00	0.00E+00
Benzene	0.00E+00	0.00E+00	4.79E-10	1.15E-10
Cadmium	2.11E-09	1.03E-09	0.00E+00	0.00E+00
Chlorobenzene	0.00E+00	0.00E+00	9.41E-13	8.10E-13
Chromium	4.17E-08	2.51E-08	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	0.00E+00	0.00E+00	2.45E-12	1.64E-12
Ethyl Benzene	0.00E+00	0.00E+00	6.62E-11	2.61E-11
Lead	5.43E-09	2.01E-09	0.00E+00	0.00E+00
Toluene	5.54E-10	2.06E-10	1.09E-11	4.63E-12
1,1,1 Trichloroethane	0.00E+00	0.00E+00	7.49E-12	5.71E-12
Trichloroethylene	0.00E+00	0.00E+00	8.74E-12	3.27E-12
Xylenes	0.00E+00	0.00E+00	4.50E-10	1.90E-10

TABLE P-82

TOTAL CHRONIC INTAKE FOR ADULTS NEAR SITE 4
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Dermal Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	3.38E-05	8.11E-06	5.03E-03	1.21E-03
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	8.00E-08	6.89E-08	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	1.93E-07	1.29E-07	0.00E+00	0.00E+00
Ethyl Benzene	5.45E-06	2.15E-06	1.98E-06	7.80E-07
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	8.36E-07	3.55E-07	2.73E-07	1.16E-07
1,1,1 Trichloroethane	6.91E-07	5.27E-07	0.00E+00	0.00E+00
Trichloroethylene	8.00E-07	2.99E-07	0.00E+00	0.00E+00
Xylenes	3.71E-05	1.57E-05	0.00E+00	0.00E+00

TABLE P-83

TOTAL CHRONIC INTAKE FOR CHILDREN NEAR SITE 4
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Dermal Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	1.77E-04	4.26E-05	1.37E-02	3.28E-03
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	4.20E-07	3.62E-07	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trans-1,2 Dichloroethylene	1.01E-06	6.79E-07	0.00E+00	0.00E+00
Ethyl Benzene	2.86E-05	1.13E-05	5.38E-06	2.12E-06
Lead	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	4.39E-06	1.86E-06	7.43E-07	3.15E-07
1,1,1 Trichloroethane	3.63E-06	2.77E-06	0.00E+00	0.00E+00
Trichloroethylene	4.20E-06	1.57E-06	0.00E+00	0.00E+00
Xylenes	1.95E-04	8.23E-05	0.00E+00	0.00E+00

TABLE P-84

CHRONIC HAZARD INDEX
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 4
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	2.43E-03	5.10E-02	4.76E-02	1.86E-03	5.10E-02	3.64E-02
Benzene	6.29E-04	NA	0.00E+00	3.60E-04	NA	0.00E+00
Cadmium	7.09E-06	2.90E-04	2.44E-02	6.40E-06	2.90E-04	2.21E-02
Chlorobenzene	0.00E+00	2.70E-02	0.00E+00	0.00E+00	2.70E-02	0.00E+00
Chromium	5.58E-05	5.00E-03	1.12E-02	3.92E-05	5.00E-03	7.84E-03
Trans-1,2 Dichloroethylene	1.66E-04	2.00E-02	8.29E-03	7.43E-05	2.00E-02	3.71E-03
Ethyl Benzene	2.01E-08	1.00E-01	2.01E-07	1.01E-08	1.00E-01	1.01E-07
Lead	1.84E-09	NA	0.00E+00	1.03E-09	NA	0.00E+00
Toluene	4.19E-08	3.00E-01	1.40E-07	4.57E-09	3.00E-01	1.52E-08
1,1,1 Trichloroethane	0.00E+00	9.00E-02	0.00E+00	0.00E+00	9.00E-02	0.00E+00
Trichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	7.77E-05	1.00E-02	7.77E-03	3.87E-05	1.00E-02	3.87E-03

TABLE P-85

CHRONIC HAZARD INDEX
ONSITE CHILD RESIDENTS AT SITE 4
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	1.82E-03	5.10E-02	3.57E-02	1.39E-03	5.10E-02	2.73E-02
Benzene	4.71E-04	NA (c)	0.00E+00	2.70E-04	NA	0.00E+00
Cadmium	5.31E-06	2.90E-04	1.83E-02	4.80E-06	2.90E-04	1.66E-02
Chlorobenzene	0.00E+00	2.70E-02	0.00E+00	0.00E+00	2.70E-02	0.00E+00
Chromium	4.18E-05	5.00E-03	8.36E-03	2.94E-05	5.00E-03	5.88E-03
Trans-1,2 Dichloroethylene	1.24E-04	2.00E-02	6.21E-03	5.57E-05	2.00E-02	2.79E-03
Ethyl Benzene	0.00E+00	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	0.00E+00	3.00E-01	0.00E+00	0.00E+00	3.00E-01	0.00E+00
1,1,1 Trichloroethane	0.00E+00	9.00E-02	0.00E+00	0.00E+00	9.00E-02	0.00E+00
Trichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	5.79E-05	1.00E-02	5.79E-03	2.89E-05	1.00E-02	2.89E-03

a. CDI = Chronic Daily Intake

b. AIC = Acceptable Chronic Intake

c. NA = Data not available.

TABLE P-86

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 4
CURRENT - UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	0.00E+00	1.40E-04	0.00E+00	7.69E-08	5.10E-02	1.51E-06
Benzene	4.79E-10	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Cadmium	0.00E+00	NA	0.00E+00	2.11E-09	2.90E-04	7.26E-06
Chlorobenzene	9.41E-13	5.70E-03	1.65E-10	0.00E+00	2.70E-02	0.00E+00
Chromium	0.00E+00	NA	0.00E+00	4.17E-08	5.00E-03	8.34E-06
Trans-1,2 Dichloroethylene	2.45E-12	NA	0.00E+00	0.00E+00	2.00E-02	0.00E+00
Ethyl Benzene	6.62E-11	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
Lead	0.00E+00	NA	0.00E+00	5.43E-09	NA	0.00E+00
Toluene	1.09E-11	1.50E+00	7.27E-12	5.54E-10	3.00E-01	1.85E-09
1,1,1 Trichloroethane	7.49E-12	6.30E+00	1.19E-12	0.00E+00	9.00E-02	0.00E+00
Trichloroethylene	8.74E-12	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	4.50E-10	4.00E-01	1.13E-09	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-87

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 4
CURRENT - BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	0.00E+00	1.40E-04	0.00E+00	5.23E-08	5.10E-02	1.03E-06
Benzene	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Cadmium	1.15E-10	NA	0.00E+00	1.03E-09	2.90E-04	3.56E-06
Chlorobenzene	0.00E+00	5.70E-03	0.00E+00	0.00E+00	2.70E-02	0.00E+00
Chromium	8.10E-13	NA	0.00E+00	2.51E-08	5.00E-03	5.02E-06
Trans-1,2 Dichloroethylene	0.00E+00	NA	0.00E+00	0.00E+00	2.00E-02	0.00E+00
Ethyl Benzene	1.64E-12	NA	0.00E+00	0.00E+00	1.00E-01	0.00E+00
Lead	2.61E-11	NA	0.00E+00	2.01E-09	NA	0.00E+00
Toluene	0.00E+00	1.50E+00	0.00E+00	2.06E-10	3.00E-01	6.85E-10
1,1,1 Trichloroethane	4.63E-12	6.30E+00	7.35E-13	0.00E+00	9.00E-02	0.00E+00
Trichloroethylene	5.71E-12	NA	0.00E+00	0.00E+00	NA	0.00E+00
Xylenes	3.27E-12	4.00E-01	8.17E-12	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-88

CHRONIC HAZARD INDEX FOR ADULTS NEAR SITE 4
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	0.00E+00	5.10E-02	0.00E+00	0.00E+00	5.10E-02	0.00E+00
Benzene	3.38E-05	NA (c)	0.00E+00	8.11E-06	NA	0.00E+00
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chlorobenzene	8.00E-08	2.70E-02	2.96E-06	6.89E-08	2.70E-02	2.55E-06
Chromium	0.00E+00	5.00E-03	0.00E+00	0.00E+00	5.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	1.93E-07	2.00E-02	9.63E-06	1.29E-07	2.00E-02	6.47E-06
Ethyl Benzene	5.45E-06	1.00E-01	5.45E-05	2.15E-06	1.00E-01	2.15E-05
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	8.36E-07	3.00E-01	2.79E-06	3.55E-07	3.00E-01	1.18E-06
1,1,1 Trichloroethane	6.91E-07	9.00E-02	7.67E-06	5.27E-07	9.00E-02	5.86E-06
Trichloroethylene	8.00E-07	NA	0.00E+00	2.99E-07	NA	0.00E+00
Xylenes	3.71E-05	1.00E-02	3.71E-03	1.57E-05	1.00E-02	1.57E-03

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-89

CHRONIC HAZARD INDEX FOR CHILDREN NEAR SITE 4
CURRENT

Indicator Chemical	Upper Bound CDI (a) (mg/kg/day)	Upper Bound AIC (b) (mg/kg/day)	Upper Bound CDI:AIC	Best Estimate CDI (mg/kg/day)	Best Estimate AIC (mg/kg/day)	Best Estimate CDI:AIC
Barium	0.00E+00	5.10E-02	0.00E+00	0.00E+00	5.10E-02	0.00E+00
Benzene	1.77E-04	NA (c)	0.00E+00	4.26E-05	NA	0.00E+00
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chlorobenzene	4.20E-07	2.70E-02	1.55E-05	3.62E-07	2.70E-02	1.34E-05
Chromium	0.00E+00	5.00E-03	0.00E+00	0.00E+00	5.00E-03	0.00E+00
Trans-1,2 Dichloroethylene	1.01E-06	2.00E-02	5.06E-05	6.79E-07	2.00E-02	3.40E-05
Ethyl Benzene	2.86E-05	1.00E-01	2.86E-04	1.13E-05	1.00E-01	1.13E-04
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	4.39E-06	3.00E-01	1.46E-05	1.86E-06	3.00E-01	6.21E-06
1,1,1 Trichloroethane	3.63E-06	9.00E-02	4.03E-05	2.77E-06	9.00E-02	3.07E-05
Trichloroethylene	4.20E-06	NA	0.00E+00	1.57E-06	NA	0.00E+00
Xylenes	1.95E-04	1.00E-02	1.95E-02	8.23E-05	1.00E-02	8.23E-03

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. NA = Data not available.

TABLE P-90

RISK FROM POTENTIAL CARCINOGENS
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 4
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	2.43E-03	- (b)	0.00E+00	1.86E-03	-	0.00E+00
Benzene	6.29E-04	2.90E-02	1.82E-05	3.60E-04	2.90E-02	1.04E-05
Cadmium	7.09E-06	NA (c)	0.00E+00	6.40E-06	NA	0.00E+00
Chlorobenzene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Chromium	5.58E-05	NA	0.00E+00	3.92E-05	NA	0.00E+00
Trans-1,2 Dichloroethylene	1.66E-04	-	0.00E+00	7.43E-05	-	0.00E+00
Ethyl Benzene	2.01E-08	-	0.00E+00	1.01E-08	-	0.00E+00
Lead	1.84E-09	NA	0.00E+00	1.03E-09	NA	0.00E+00
Toluene	4.19E-08	-	0.00E+00	4.57E-09	-	0.00E+00
1,1,1 Trichloroethane	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Trichloroethylene	0.00E+00	1.10E-02	0.00E+00	0.00E+00	1.10E-02	0.00E+00
Xylenes	7.77E-05	-	0.00E+00	3.87E-05	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-91

RISK FROM POTENTIAL CARCINOGENS
ONSITE CHILD RESIDENTS AT SITE 4
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	1.82E-03	- (b)	0.00E+[illegible]	1.39E-03	-	0.00E+00
Benzene	4.71E-04	2.90E-02	[illegible].05	2.70E-04	2.90E-02	7.83E-06
Cadmium	5.31E-06	NA (c)	0.00E+00	4.80E-06	NA	0.00E+00
Chlorobenzene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Chromium	4.18E-05	NA	0.00E+00	2.94E-05	NA	0.00E+00
Trans-1,2 Dichloroethylene	1.24E-04	-	0.00E+00	5.57E-05	-	0.00E+00
Ethyl Benzene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
1,1,1 Trichloroethane	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Trichloroethylene	0.00E+00	1.10E-02	0.00E+00	0.00E+00	1.10E-02	0.00E+00
Xylenes	5.79E-05	-	0.00E+00	2.89E-05	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-92

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 4
UPPER BOUND

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	7.69E-08	-	0.00E+00
Benzene	4.79E-10	2.90E-02	1.39E-11	0.00E+00	2.90E-02	0.00E+00
Cadmium	0.00E+00	6.10E+00	0.00E+00	2.11E-09	NA (c)	0.00E+00
Chlorobenzene	9.41E-13	-	0.00E+00	0.00E+00	-	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00	4.17E-08	NA	0.00E+00
Trans-1,2 Dichloroethylene	2.45E-12	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	6.62E-11	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	5.43E-09	NA	0.00E+00
Toluene	1.09E-11	-	0.00E+00	5.54E-10	-	0.00E+00
1,1,1 Trichloroethane	7.49E-12	-	0.00E+00	0.00E+00	-	0.00E+00
Trichloroethylene	8.74E-12	1.30E-02	1.14E-13	0.00E+00	1.10E-02	0.00E+00
Xylenes	4.50E-10	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-93

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 4
BEST ESTIMATE

Indicator Chemical	Inhalation-Adult			Oral-Adult		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	5.23E-08	-	0.00E+00
Benzene	1.15E-10	2.90E-02	3.33E-12	0.00E+00	2.90E-02	0.00E+00
Cadmium	0.00E+00	6.10E+00	0.00E+00	1.03E-09	NA (c)	0.00E+00
Chlorobenzene	8.10E-13	-	0.00E+00	0.00E+00	-	0.00E+00
Chromium	0.00E+00	4.10E+01	0.00E+00	2.51E-08	NA	0.00E+00
Trans-1,2 Dichloroethylene	1.64E-12	-	0.00E+00	0.00E+00	-	0.00E+00
Ethyl Benzene	2.61E-11	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	2.01E-09	NA	0.00E+00
Toluene	4.63E-12	-	0.00E+00	2.06E-10	-	0.00E+00
1,1,1 Trichloroethane	5.71E-12	-	0.00E+00	0.00E+00	-	0.00E+00
Trichloroethylene	3.27E-12	1.30E-02	4.25E-14	0.00E+00	1.10E-02	0.00E+00
Xylenes	1.90E-10	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-94

RISK FROM POTENTIAL CARCINOGENS FOR ADULTS NEAR SITE 4
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	0.00E+00	-	0.00E+00
Benzene	3.38E-05	2.90E-02	9.80E-07	8.11E-06	2.90E-02	2.35E-07
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Chlorobenzene	8.00E-08	-	0.00E+00	6.89E-08	-	0.00E+00
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Trans-1,2 Dichloroethylene	1.93E-07	-	0.00E+00	1.29E-07	-	0.00E+00
Ethyl Benzene	5.45E-06	-	0.00E+00	2.15E-06	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	8.36E-07	-	0.00E+00	3.55E-07	-	0.00E+00
1,1,1 Trichloroethane	6.91E-07	-	0.00E+00	5.27E-07	-	0.00E+00
Trichloroethylene	8.00E-07	1.10E-02	8.80E-09	2.99E-07	1.10E-02	3.29E-09
Xylenes	3.71E-05	-	0.00E+00	1.57E-05	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

TABLE P-95

RISK FROM POTENTIAL CARCINOGENS FOR CHILDREN NEAR SITE 4
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	0.00E+00	-	0.00E+00
Benzene	1.77E-04	2.90E-02	5.15E-06	4.26E-05	2.90E-02	1.24E-06
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Chlorobenzene	4.20E-07	-	0.00E+00	3.62E-07	-	0.00E+00
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Trans-1,2 Dichloroethylene	1.01E-06	-	0.00E+00	6.79E-07	-	0.00E+00
Ethyl Benzene	2.86E-05	-	0.00E+00	1.13E-05	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	4.39E-06	-	0.00E+00	1.86E-06	-	0.00E+00
1,1,1 Trichloroethane	3.63E-06	-	0.00E+00	2.77E-06	-	0.00E+00
Trichloroethylene	4.20E-06	1.10E-02	4.62E-08	1.57E-06	1.10E-02	1.73E-08
Xylenes	1.95E-04	-	0.00E+00	8.23E-05	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound.
c. NA = Data not available.

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SECTION P.5
SITE 8 RISK ASSESSMENT TABLES

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SECTION P.5

SITE 8 RISK ASSESSMENT TABLES

This section contains the risk assessment worksheets for Site 8.

P.5.1 Site 8 Indicator Chemical Selection

Data used in the selection of indicator chemicals were compiled from both the Remedial Investigation performed at the Base by ES in 1988 and the 1986 study (Dames & Moore, 1987). These data are summarized in Table P-96, while Tables P-97 through P-100 step through the USEPA selection process.

P.5.2 Site 8 Estimation of Chemical Intake for Each Pathway

Tables P-101 through P-108 summarize the upper bound and best estimate chronic daily intakes from each potential pathway for each population at risk, as calculated from the maximum and average chemical concentrations, respectively.

P.5.3 Site 8 Estimation of Total Chemical Intake for Each Exposure Route

Chronic daily intakes for pathways categorized as oral, dermal or inhalation routes are summed to yield total chronic daily intake via a particular route for a target population. Tables P-109 through P-113 present the total chemical intake for each exposure route.

P.5.4 Site 8 Characterization of Risk from Noncarcinogens

Tables P-114 through P-118 present the chr, 'c hazard values for each target population.

P.5.5 Site 8 Characterization of Risk From Potential Carcinogens

Tables P-119 through P-123 present the risk from potential carcinogens for each target population.

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TABLE P-96

MAXIMUM AND REPRESENTATIVE CHEMICAL CONCENTRATIONS AT SITE 8

Parameter	CAS (a) Number	Ground Water (mg/L)			Surface Water (mg/L)			Sediment (mg/kg)			Soils at 0 to 2 Feet (mg/kg)			Soils Below 2 Feet (mg/kg)		
		Maximum Value	Represent-ative Value	No. Detected/ No. Analyzed	Maximum Value	Represent-ative Value	No. Detected/ No. Analyzed	Maximum Value	Represent-ative Value	No. Detected/ No. Analyzed	Maximum Value	Represent-ative Value	No. Detected/ No. Analyzed	Maximum Value	Represent-ative Value	No. Detected/ No. Analyzed
Barium	7440-39-3	1.00E+00	2.88E-01	6/11	ND (b)	ND	0/3	1.00E+00	7.65E-02	6/6	2.00E-01	7.70E-02	8/8	8.50E-02	4.73E-02	19/19
Cadmium	7740-43-9	ND	ND	0/11	ND	ND	0/3	ND	ND	0/6	1.01E-02	8.43E-03	6/8	1.44E-02	1.06E-02	12/19
Chromium	7440-47-3	5.20E-01	1.16E-01	8/11	ND	ND	0/3	4.80E-02	2.40E-02	6/6	4.00E-02	2.82E-02	8/8	4.34E-02	2.88E-02	19/19
4,4' DDD	72-54-8	ND	ND	0/11	9.00E-03	6.00E-03	2/5	ND	ND	0/6	1.80E-01	4.88E-02	6/36	ND	ND	0/20
4,4' DDE	72-55-9	ND	ND	0/11	ND	ND	0/5	ND	ND	0/6	1.30E-01	4.32E-02	5/36	ND	ND	0/20
4,4' DDT	50-29-3	ND	ND	0/11	1.00E-02	5.00E-03	1/5	ND	ND	0/6	1.50E+00	2.46E-01	8/36	ND	ND	0/20
Delta BHC	319-86-8	ND	ND	0/8	ND	ND	0/3	ND	ND	1/6	ND	ND	0/34	ND	ND	0/13
Dieldrin	60-57-1	ND	ND	0/8	ND	ND	0/3	ND	ND	0/6	1.00E-03	5.00E-04	1/34	ND	ND	0/13
Endosulfan I	115-29-7	ND	ND	0/8	ND	ND	0/3	4.00E-02	4.00E-02	1/6	ND	ND	0/36	ND	ND	0/13
Lead	7439-92-1	ND	ND	0/11	4.00E-02	3.50E-02	2/3	1.90E-01	4.66E-02	5/6	1.80E-02	1.02E-02	7/8	1.14E-02	6.16E-03	12/19
PCB's	1336-36-3	ND	ND	0/8	ND	ND	0/3	2.30E+00	2.30E+00	1/6	3.30E-01	3.30E-01	1/36	ND	ND	0/20
Toluene	108-88-3	ND	ND	0/11	6.50E-03	3.25E-03	1/5	4.10E+01	4.10E+01	1/6	1.40E+00	2.85E-01	7/9	7.20E-01	1.10E-01	12/20
Xylenes	1330-20-7	ND	ND	0/11	ND	ND	0/5	ND	ND	0/6	ND	ND	0/9	5.60E-03	2.30E-03	1/20

a. CAS = Chemical Abstracts Service
b. ND = Not Detected

Source: Engineering-Science, Inc. (1988) and Dames & Moore (1987)

TABLE P-97

TOXICITY DATA FOR COMPOUNDS DETECTED AT SITE 8

Parameter	CAS (a) Number	Toxicologic Class	Severity Rating (RVe) (b)		Carcinogen Assessment Group (CAG) (c)		Toxicity Constants (d)			
							Noncarcinogens		Potential Carcinogens	
			Oral Route	Inhalation Route	Oral Route	Inhalation Route	Water (wT) (e) (L/mg)	Soil (sT) (f) (kg/mg)	Water (wT) (L/mg)	Soil (sT) (kg/mg)
Barium	7440-39-3	NC (g)	10	10	D	D	4.08E+00	2.04E-04	- (h)	-
Cadmium	7740-43-9	NC, PC (i)	10	8	-	B1	4.45E+00	2.23E-04	-	-
Chromium	7440-47-3	NC, PC	-	8	-	A	NA (j)	NA	-	-
4,4' DDD	72-54-8	NC, PC	-	-	B2	B2	NA	NA	3.71E-02	1.86E-06
4,4' DDE	72-55-9	NC, PC	-	-	B2	B2	NA	NA	1.13E-01	5.64E-06
4,4' DDT	50-29-3	NC, PC	-	-	B2	B2	NA	NA	1.59E-01	7.97E-06
Delta BHC	319-86-8	NC	-	-	D	D	NA	NA	-	-
Dieldrin	60-57-1	NC, PC	-	-	B2	B2	NA	NA	3.66E+00	1.83E-04
Endosulfan I	115-29-7	NC	-	-	D	D	NA	NA	-	-
Lead	7439-92-1	NC, PC	10	10	B2	B2	8.93E-01	4.46E-05	NA	NA
PCB's	1336-36-3	NC, PC	-	-	B2	B2	NA	NA	5.71E-01	2.86E-05
Toluene	108-88-3	NC	7	10	-	-	5.20E-03	2.60E-07	-	-
Xylenes	1330-20-7	NC	8	8	-	-	1.07E-01	5.33E-06	-	-

a. CAS = Chemical Abstracts Service
b. Rating Value = RVe = USEPA health effect rating value for noncarcinogens
c. Carcinogen Assessment Group = CAG = USEPA classification of carcinogenicity
d. Toxicity Constant = USEPA potency factor based on either carcinogenic or noncarcinogenic endpoints for a given medium
e. wT = Water toxicity constant
f. sT = Soil toxicity constant
g. NC = Noncarcinogenic effects
h. Not applicable to parameter
i. PC = Potential Carcinogen
j. NA = No data available

Source: U.S. Environmental Protection Agency (1986a)

TABLE P-98

CT VALUES FOR NONCARCINOGENIC COMPOUNDS DETECTED AT SITE 8

Parameter	CAS (a) Number	Ground Water CT Value (b		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Barium	7440-39-3	4.08E+00	1.18E+00	0.00E+00	0.00E+00	2.04E-04	1.56E-05	4.08E-05	1.57E-05	1.73E-05	9.65E-06
Cadmium	7740-43-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-06	1.88E-06	3.21E-06	2.36E-06
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
4,4' DDD	72-54-8	-	-	-	-	-	-	-	-	-	-
4,4' DDE	72-55-9	-	-	-	-	-	-	-	-	-	-
4,4' DDT	50-29-3	-	-	-	-	-	-	-	-	-	-
Delta BHC	319-86-8	-	-	-	-	-	-	-	-	-	-
Dieldrin	60-57-1	-	-	-	-	-	-	-	-	-	-
Endosulfan I	115-29-7	-	-	-	-	-		-	-	-	-
Lead	7439-92-1	0.00E+00	0.00E+00	3.57E-02	3.13E-02	8.47E-06	2.08E-06	6.03E-07	4.56E-07	5.08E-07	2.75E-07
PCB's	1336-36-3	-	-	-	-	-	-	-	-	-	-
Toluene	108-88-3	0.00E+00	0.00E+00	3.38E-05	1.69E-05	1.07E-05	1.07E-05	3.64E-07	7.41E-08	1.87E-07	2.86E-08
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-08	1.49E-08

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-99

CT VALUES FOR POTENTIALLY CARCINOGENIC COMPOUNDS DETECTED AT SITE 8

Parameter	CAS (a) Number	Ground Water CT Value (b)		Surface Water CT Value		Sediment CT Value		CT Values for Soils			
								0 to 2 Feet		Below 2 Feet	
		Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value	Maximum Value	Represent-ative Value
Barium	7440-39-3	-	-	-	-	-	-	-	-	-	-
Cadmium	7740-43-9	-	-	-	-	-	-	-	-	-	-
Chromium	7440-47-3	-	-	-	-	-	-	-	-	-	-
4,4' DDD	72-54-8	0.00E+00	0.00E+00	3.34E-04	2.23E-04	0.00E+00	0.00E+00	3.35E-07	9.08E-08	0.00E+00	0.00E+00
4,4' DDE	72-55-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.33E-07	2.44E-07	0.00E+00	0.00E+00
4,4' DDT	50-29-3	0.00E+00	0.00E+00	1.59E-03	7.95E-04	0.00E+00	0.00E+00	1.20E-05	1.96E-06	0.00E+00	0.00E+00
Delta BHC	319-86-8	-	-	-	-	-	-	-	-	-	-
Dieldrin	60-57-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-07	9.15E-08	0.00E+00	0.00E+00
Endosulfan I	115-29-7	-	-	-	-	-	-	-	-	-	-
Lead	7439-92-1	-	-	-	-	-	-	-	-	-	-
PCB's	1336-36-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.58E-05	6.58E-05	9.44E-06	9.44E-06	0.00E+00	0.00E+00
Toluene	108-88-3	-	-	-	-	-	-	-	-	-	-
Xylenes	1330-20-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

a. CAS = Chemical Abstracts Service
b. CT Value = Concentration x Toxicity. CT values equaling zero are the result of nondetected compounds.
c. No toxicity data available.

TABLE P-100

INDICATOR SCORES AND TENTATIVE RANKING FOR COMPOUNDS DETECTED AT SITE 8

Parameter	CAS (a) Number	Indicator Score for Noncarcinogenic Effects		Tentative Rank for Noncarcinogenic Effects		Indicator Score for Potential Carcinogens		Tentative Rank for Potential Carcinogens	
		Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value	Maximum Value	Representative Value
Barium	7440-39-3	4.34E+00	1.22E+00	1	1				
Cadmium	7740-43-9	5.46E-03	4.24E-03	3	3				
Chromium	7440-47-3								
4,4' DDD	72-54-8					3.34E-04	2.23E-04	2	2
4,4' DDE	72-55-9					7.33E-07	2.44E-07	4	4
4,4' DDT	50-29-3					1.60E-03	7.97E-04	1	1
Delta BHC	319-86-8								
Dieldrin	60-57-1					1.83E-07	9.15E-08	5	5
Endosulfan I	115-29-7								
Lead	7439-92-1	4.51E-02	3.41E-02	2	2				
PCB's	1336-36-3					7.52E-05	7.52E-05	3	3
Toluene	108-88-3	4.50E-05	2.77E-05	4	4				
Xylenes	1330-20-7	2.98E-08	1.49E-08	5	5				

a. CAS = Chemical Abstracts Service

TABLE P-101

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF SOIL AT DEPTH
FOR WORKERS AT SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	8.50E+01	4.73E+01	5.00E-01	8.39E-10	7.13E-08	3.97E-08
Cadmium	1.44E+01	1.06E+01	8.00E-02	1.34E-10	1.93E-09	1.42E-09
Chromium	4.34E-02	2.88E-02	5.00E-01	8.39E-10	3.64E-11	2.42E-11
4,4' DDT	ND (b)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Dieldrin	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Endosulfan I	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Lead	2.75E+00	6.16E+00	1.50E-01	2.52E-10	6.92E-10	1.55E-09
Toluene	7.20E-01	1.10E-01	1.00E+00	1.68E-09	1.21E-09	1.85E-10
Xylenes	5.60E-03	2.80E-03	1.00E+00	1.68E-09	9.39E-12	4.70E-12

a. ND = Not Detected

TABLE P-102

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER FOR ADULT ONSITE RESIDENTS OR WORKERS AT SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	1.00E+00	2.88E-01	5.00E-01	1.43E-02	1.43E-02	4.11E-03
Cadmium	ND (a)	ND	8.00E-02	2.29E-03	0.00E+00	0.00E+00
Chromium	5.20E-01	1.16E-01	5.00E-01	1.43E-02	7.43E-03	1.66E-03
4,4' DDT	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Dieldrin	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Endosulfan I	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Lead	ND	ND	1.50E-01	4.29E-03	0.00E+00	0.00E+00
Toluene	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00
Xylenes	ND	ND	1.00E+00	2.86E-02	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-103

FUTURE EXPOSURE POINT INTAKE VIA INGESTION OF GROUND WATER AS DRINKING WATER
FOR CHILD RESIDENTS AT SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	1.00E+00	2.88E-01	5.00E-01	1.07E-02	1.07E-02	3.09E-03
Cadmium	ND (a)	ND	8.00E-02	1.71E-03	0.00E+00	0.00E+00
Chromium	5.20E-01	1.16E-01	5.00E-01	1.07E-02	5.57E-03	1.24E-03
4,4' DDT	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Dieldrin	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Endosulfan I	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Lead	ND	ND	4.00E-01	8.57E-03	0.00E+00	0.00E+00
Toluene	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00
Xylenes	ND	ND	1.00E+00	2.14E-02	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-104

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE SOILS
FOR WORKERS AT SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/kg)		Fraction Absorbed Into Body	Human Intake Factor (kg/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	2.00E+02	7.70E+01	5.00E-01	8.39E-10	1.68E-07	6.45E-08
Cadmium	1.01E+01	8.43E+00	8.00E-02	1.34E-10	1.36E-09	1.13E-09
Chromium	4.00E-02	2.80E-02	5.00E-01	8.39E-10	3.35E-11	2.35E-11
4,4' DDT	1.50E+00	2.46E-01	1.00E+00	1.68E-09	2.52E-09	4.13E-10
Dieldrin	1.00E-03	5.00E-04	1.00E+00	1.68E-09	1.68E-12	8.39E-13
Endosulfan I	ND (a)	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00
Lead	1.80E+01	1.02E+01	1.50E-01	2.52E-10	4.53E-09	2.57E-09
Toluene	1.40E+00	2.85E-01	1.00E+00	1.68E-09	2.35E-09	4.78E-10
Xylenes	ND	ND	1.00E+00	1.68E-09	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-105

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION
FOR ADULTS NEAR SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	ND (a)	ND	5.00E-01	1.82E-05	0.00E+00	0.00E+00
Cadmium	ND	ND	8.00E-02	2.91E-06	0.00E+00	0.00E+00
Chromium	ND	ND	5.00E-01	1.82E-05	0.00E+00	0.00E+00
4,4' DDT	1.00E-02	5.00E-03	1.00E+00	3.63E-05	3.63E-07	1.82E-07
Dieldrin	ND	ND	1.00E+00	3.63E-05	0.00E+00	0.00E+00
Endosulfan I	ND	ND	1.00E+00	3.63E-05	0.00E+00	0.00E+00
Lead	4.00E-02	3.50E-02	1.50E-01	5.45E-06	2.18E-07	1.91E-07
Toluene	6.50E-03	3.25E-03	1.00E+00	3.63E-05	2.36E-07	1.18E-07
Xylenes	ND	ND	1.00E+00	3.63E-05	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-106

CURRENT EXPOSURE POINT INTAKE VIA DERMAL CONTACT WITH SURFACE WATER DURING RECREATION FOR ADULTS NEAR SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Permeability Constant (cm/hr)	Exposed Skin Area (cm2)	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative				Upper Bound	Best Estimate
Barium	ND (a)	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Cadmium	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Chromium	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
4,4' DDT	1.00E-02	5.00E-03	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Dieldrin	ND	ND	5.10E-04	1.82E+04	6.73E-06	0.00E+00	0.00E+00
Endosulfan I	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Lead	4.00E-02	3.50E-02	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00
Toluene	6.50E-03	3.25E-03	9.00E-04	1.82E+04	1.19E-05	7.72E-08	3.86E-08
Xylenes	ND	ND	NA	1.82E+04	0.00E+00	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-107

CURRENT EXPOSURE POINT INTAKE VIA INGESTION OF SURFACE WATER DURING RECREATION
FOR CHILDREN NEAR SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Fraction Absorbed	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative			Upper Bound	Best Estimate
Barium	ND (a)	ND	5.00E-01	9.54E-05	0.00E+00	0.00E+00
Cadmium	ND	ND	8.00E-02	1.53E-05	0.00E+00	0.00E+00
Chromium	ND	ND	5.00E-01	9.54E-05	0.00E+00	0.00E+00
4,4' DDT	1.00E-02	5.00E-03	1.00E+00	1.91E-04	1.91E-06	9.54E-07
Dieldrin	ND	ND	1.00E+00	1.91E-04	0.00E+00	0.00E+00
Endosulfan I	ND	ND	1.00E+00	1.91E-04	0.00E+00	0.00E+00
Lead	4.00E-02	3.50E-02	4.00E-01	7.63E-05	3.05E-06	2.67E-06
Toluene	6.50E-03	3.25E-03	1.00E+00	1.91E-04	1.24E-06	6.20E-07
Xylenes	ND	ND	1.00E+00	1.91E-04	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-108

CURRENT EXPOSURE POINT INTAKE VIA DERMAL CONTACT WITH SURFACE WATER DURING RECREATION
FOR CHILDREN NEAR SITE 8

Indicator Chemical	Indicator Chemical Concentration (mg/L)		Permeability Constant (cm/hr)	Exposed Skin Area (cm2)	Human Intake Factor (L/day/kg)	Chronic Daily Intake (mg/kg/day)	
	Maximum	Representative				Upper Bound	Best Estimate
Barium	ND (a)	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Cadmium	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Chromium	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
4,4' DDT	1.00E-02	5.00E-03	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Dieldrin	ND	ND	5.10E-04	9.40E+03	1.83E-05	0.00E+00	0.00E+00
Endosulfan I	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Lead	4.00E-02	3.50E-02	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00
Toluene	6.50E-03	3.25E-03	9.00E-04	9.40E+03	3.23E-05	2.10E-07	1.05E-07
Xylenes	ND	ND	NA	9.40E+03	0.00E+00	0.00E+00	0.00E+00

a. ND = Not Detected

TABLE P-109

FUTURE TOTAL CHRONIC INTAKE
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 8

Indicator Chemical	Ingestion of Soil at Depth (mg/kg/day)		Ingestion of Ground Water (mg/kg/day)		Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	7.13E-08	3.97E-08	1.43E-02	4.11E-03	1.43E-02	4.11E-03
Cadmium	1.93E-09	1.42E-09	0.00E+00	0.00E+00	1.93E-09	1.42E-09
Chromium	3.64E-11	2.42E-11	7.43E-03	1.66E-03	7.43E-03	1.66E-03
4,4' DDT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dieldrin	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Endosulfan I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	6.92E-10	1.55E-09	0.00E+00	0.00E+00	6.92E-10	1.55E-09
Toluene	1.21E-09	1.85E-10	0.00E+00	0.00E+00	1.21E-09	1.85E-10
Xylenes	9.39E-12	4.70E-12	0.00E+00	0.00E+00	9.39E-12	4.70E-12

TABLE P-110

FUTURE TOTAL CHRONIC INTAKE
ONSITE CHILD RESIDENTS AT SITE 8

Indicator Chemical	Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate
Barium	1.07E-02	3.09E-03
Cadmium	0.00E+00	0.00E+00
Chromium	5.57E-03	1.24E-03
4,4' DDT	0.00E+00	0.00E+00
Dieldrin	0.00E+00	0.00E+00
Endosulfan I	0.00E+00	0.00E+00
Lead	0.00E+00	0.00E+00
Toluene	0.00E+00	0.00E+00
Xylenes	0.00E+00	0.00E+00

TABLE P-111

T· 'AL CHRONIC INTAKE FOR WORKERS AT SITE 8
CURRENT

Indicator Chemical	Total Chronic Daily Intakes Ingestion Route (mg/kg/day)	
	Upper Bound	Best Estimate
Barium	1.68E-07	6.45E-08
Cadmium	1.36E-09	1.13E-09
Chromium	3.35E-11	2.35E-11
4,4' DDT	2.52E-09	4.13E-10
Dieldrin	1.68E-12	8.39E-13
Endosulfan I	0.00E+00	0.00E+00
Lead	4.53E-09	2.57E-09
Toluene	2.35E-09	4.78E-10
Xylenes	0.00E+00	0.00E+00

TABLE P-112

TOTAL CHRONIC INTAKE FOR ADULTS NEAR SITE 8
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Dermal Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4,4' DDT	3.63E-07	1.82E-07	0.00E+00	0.00E+00
Dieldrin	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Endosulfan I	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	2.18E-07	1.91E-07	0.00E+00	0.00E+00
Toluene	2.36E-07	1.18E-07	7.72E-08	3.86E-08
Xylenes	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE P-113

TOTAL CHRONIC INTAKE FOR CHILDREN NEAR SITE 8
CURRENT

Indicator Chemical	Total Chronic Daily Intake Oral Route (mg/kg/day)		Total Chronic Daily Intake Dermal Route (mg/kg/day)	
	Upper Bound	Best Estimate	Upper Bound	Best Estimate
Barium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4,4' DDT	1.91E-06	9.54E-07	0.00E+00	0.00E+00
Dieldrin	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Endosulfan I	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead	3.05E-06	2.67E-06	0.00E+00	0.00E+00
Toluene	1.24E-06	6.20E-07	2.10E-07	1.05E-07
Xylenes	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE P-114

CHRONIC HAZARD INDEX
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 8
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	1.43E-02	5.10E-02	2.80E-01	4.11E-03	5.10E-02	8.07E-02
Cadmium	1.93E-09	2.90E-04	6.66E-06	1.42E-09	2.90E-04	4.90E-06
Chromium	7.43E-03	5.00E-03	1.49E+00	1.66E-03	5.00E-03	3.31E-01
4,4' DDT	0.00E+00	5.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00
Dieldrin	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Endosulfan I	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Lead	6.92E-10	NA (c)	0.00E+00	1.55E-09	NA	0.00E+00
Toluene	1.21E-09	3.00E-01	4.03E-09	1.85E-10	3.00E-01	6.15E-10
Xylenes	9.39E-12	1.00E-02	9.39E-10	4.70E-12	1.00E-02	4.70E-10

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. Data not available

TABLE P-115

CHRONIC HAZARD INDEX
ONSITE CHILD RESIDENTS AT SITE 8
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	1.07E-02	5.10E-02	2.10E-01	3.09E-03	5.10E-02	6.05E-02
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chromium	5.57E-03	5.00E-03	1.11E+00	1.24E-03	5.00E-03	2.49E-01
4,4' DDT	0.00E+00	5.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00
Dieldrin	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Endosulfan I	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Lead	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	0.00E+00	3.00E-01	0.00E+00	0.00E+00	3.00E-01	0.00E+00
Xylenes	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake

b. AIC = Acceptable Chronic Intake

c. Data not available

TABLE P-116

CHRONIC HAZARD INDEX FOR WORKERS ON SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	1.68E-07	5.10E-02	3.29E-06	6.45E-08	5.10E-02	1.27E-06
Cadmium	1.36E-09	2.90E-04	4.67E-06	1.13E-09	2.90E-04	3.90E-06
Chromium	3.35E-11	5.00E-03	6.71E-09	2.35E-11	5.00E-03	4.70E-09
4,4' DDT	2.52E-09	5.00E-04	5.03E-06	4.13E-10	5.00E-04	8.25E-07
Dieldrin	1.68E-12	5.00E-05	3.35E-08	8.39E-13	5.00E-05	1.68E-08
Endosulfan I	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Lead	4.53E-09	NA (c)	0.00E+00	2.57E-09	NA	0.00E+00
Toluene	2.35E-09	3.00E-01	7.83E-09	4.78E-10	3.00E-01	1.59E-09
Xylenes	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. Data not available

TABLE P-117

CHRONIC HAZARD INDEX FOR ADULTS NEAR SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	0.00E+00	5.10E-02	0.00E+00	0.00E+00	5.10E-02	0.00E+00
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chromium	0.00E+00	5.00E-03	0.00E+00	0.00E+00	5.00E-03	0.00E+00
4,4' DDT	3.63E-07	5.00E-04	7.27E-04	1.82E-07	5.00E-04	3.63E-04
Dieldrin	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Endosulfan I	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Lead	2.18E-07	NA (c)	0.00E+00	1.91E-07	NA	0.00E+00
Toluene	2.36E-07	3.00E-01	7.87E-07	1.18E-07	3.00E-01	3.94E-07
Xylenes	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake

b. AIC = Acceptable Chronic Intake

c. Data not available

TABLE P-118

CHRONIC HAZARD INDEX FOR CHILDREN NEAR SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	AIC (b) (mg/kg/day)	CDI:AIC	CDI (mg/kg/day)	AIC (mg/kg/day)	CDI:AIC
Barium	0.00E+00	5.10E-02	0.00E+00	0.00E+00	5.10E-02	0.00E+00
Cadmium	0.00E+00	2.90E-04	0.00E+00	0.00E+00	2.90E-04	0.00E+00
Chromium	0.00E+00	5.00E-03	0.00E+00	0.00E+00	5.00E-03	0.00E+00
4,4' DDT	1.91E-06	5.00E-04	3.82E-03	9.54E-07	5.00E-04	1.91E-03
Dieldrin	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Endosulfan I	0.00E+00	5.00E-05	0.00E+00	0.00E+00	5.00E-05	0.00E+00
Lead	3.05E-06	NA (c)	0.00E+00	2.67E-06	NA	0.00E+00
Toluene	1.24E-06	3.00E-01	4.13E-06	6.20E-07	3.00E-01	2.07E-06
Xylenes	0.00E+00	1.00E-02	0.00E+00	0.00E+00	1.00E-02	0.00E+00

a. CDI = Chronic Daily Intake
b. AIC = Acceptable Chronic Intake
c. Data not available

TABLE P-119

RISK FROM POTENTIAL CARCINOGENS
ONSITE ADULT RESIDENTS OR WORKERS AT SITE 8
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	1.43E-02	- (b)	0.00E+00	4.11E-03	- (b)	0.00E+00
Cadmium	1.93E-09	NA (c)	0.00E+00	1.42E-09	NA (c)	0.00E+00
Chromium	7.43E-03	NA	0.00E+00	1.66E-03	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	0.00E+00	3.40E-01	0.00E+00
Dieldrin	0.00E+00	1.60E+01	0.00E+00	0.00E+00	1.60E+01	0.00E+00
Endosulfan I	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	6.92E-10	NA	0.00E+00	1.55E-09	NA	0.00E+00
Toluene	1.21E-09	-	0.00E+00	1.85E-10	-	0.00E+00
Xylenes	9.39E-12	-	0.00E+00	4.70E-12	-	0.00E+00

a. CDI = Chronic Daily Intake

b. Not applicable to this compound

c. Data not available

TABLE P-120

RISK FROM POTENTIAL CARCINOGENS
ONSITE CHILD RESIDENTS AT SITE 8
FUTURE

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	1.07E-02	- (b)	0.00E+00	3.09E-03	-	0.00E+00
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA	0.00E+00
Chromium	5.57E-03	NA	0.00E+00	1.24E-03	NA	0.00E+00
4,4' DDT	0.00E+00	3.40E-01	0.00E+00	0.00E+00	3.40E-01	0.00E+00
Dieldrin	0.00E+00	1.60E+01	0.00E+00	0.00E+00	1.60E+01	0.00E+00
Endosulfan I	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
Toluene	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Xylenes	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound
c. Data not available

TABLE P-121

RISK FROM POTENTIAL CARCINOGENS FOR WORKERS ON SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	1.68E-07	- (b)	0.00E+00	6.45E-08	- (b)	0.00E+00
Cadmium	1.36E-09	NA (c)	0.00E+00	1.13E-09	NA (c)	0.00E+00
Chromium	3.35E-11	NA	0.00E+00	2.35E-11	NA	0.00E+00
4,4' DDT	2.52E-09	3.40E-01	7.40E-09	4.13E-10	3.40E-01	1.21E-09
Dieldrin	1.68E-12	1.60E+01	1.05E-13	8.39E-13	1.60E+01	5.24E-14
Endosulfan I	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	4.53E-09	NA	0.00E+00	2.57E-09	NA	0.00E+00
Toluene	2.35E-09	-	0.00E+00	4.78E-10	-	0.00E+00
Xylenes	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI - Chronic Daily Intake
b. Not applicable to this compound
c. Data not available

TABLE P-122

RISK FROM POTENTIAL CARCINOGENS FOR ADULTS NEAR SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	0.00E+00	- (b)	0.00E+00
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA (c)	0.00E+00
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
4,4' DDT	3.63E-07	3.40E-01	1.07E-06	1.82E-07	3.40E-01	5.34E-07
Dieldrin	0.00E+00	1.60E+01	0.00E+00	0.00E+00	1.60E+01	0.00E+00
Endosulfan I	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	2.18E-07	NA	0.00E+00	1.91E-07	NA	0.00E+00
Toluene	2.36E-07	-	0.00E+00	1.18E-07	-	0.00E+00
Xylenes	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound
c. Data not available

TABLE P-123

RISK FROM POTENTIAL CARCINOGENS FOR CHILDREN NEAR SITE 8
CURRENT

Indicator Chemical	Upper Bound			Best Estimate		
	CDI (a) (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk	CDI (mg/kg/day)	Potency Factor (1/mg/kg/day)	Route-Specific Risk
Barium	0.00E+00	- (b)	0.00E+00	0.00E+00	- (b)	0.00E+00
Cadmium	0.00E+00	NA (c)	0.00E+00	0.00E+00	NA (c)	0.00E+00
Chromium	0.00E+00	NA	0.00E+00	0.00E+00	NA	0.00E+00
4,4' DDT	1.91E-06	3.40E-01	5.61E-06	9.54E-07	3.40E-01	2.81E-06
Dieldrin	0.00E+00	1.60E+01	0.00E+00	0.00E+00	1.60E+01	0.00E+00
Endosulfan I	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00
Lead	3.05E-06	NA	0.00E+00	2.67E-06	NA	0.00E+00
Toluene	1.24E-06	-	0.00E+00	6.20E-07	-	0.00E+00
Xylenes	0.00E+00	-	0.00E+00	0.00E+00	-	0.00E+00

a. CDI = Chronic Daily Intake
b. Not applicable to this compound
c. Data not available

APPENDIX Q

TABLE OF CONTENTS

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APPENDIX Q
FIELD NOTES

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SECTION Q.1

INTRODUCTION

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SECTION Q.1
INTRODUCTION

The contents of the field notebooks are included here as required by the statement of work.

There are eight notebooks.

The field notes for the lithologic logs were kept on separate sheets of paper and these are included as Section Q.2.8. They are grouped by site, and within each site, in the sequence: boreholes drilled for monitoring wells and boreholes drilled for well points.

A brief summary of the contents of each notebook is given at the beginning of each section before the copies of the field notes themselves.

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SECTION Q.2
FIELD NOTES

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SECTION Q.2
FIELD NOTES

Q.2.1 Notebook 1, Field Team Leader Notebook No. 1

This notebook contains notes of the Field Team Leader for field work done during the summer of 1988. The notes consist of overall field strategy, personnel and the work progress.

All 122 pages in this notebook were used. The first entry is 6 July 1988 and the last is 8 September 1988. The pages are signed by John D. Hardeman.

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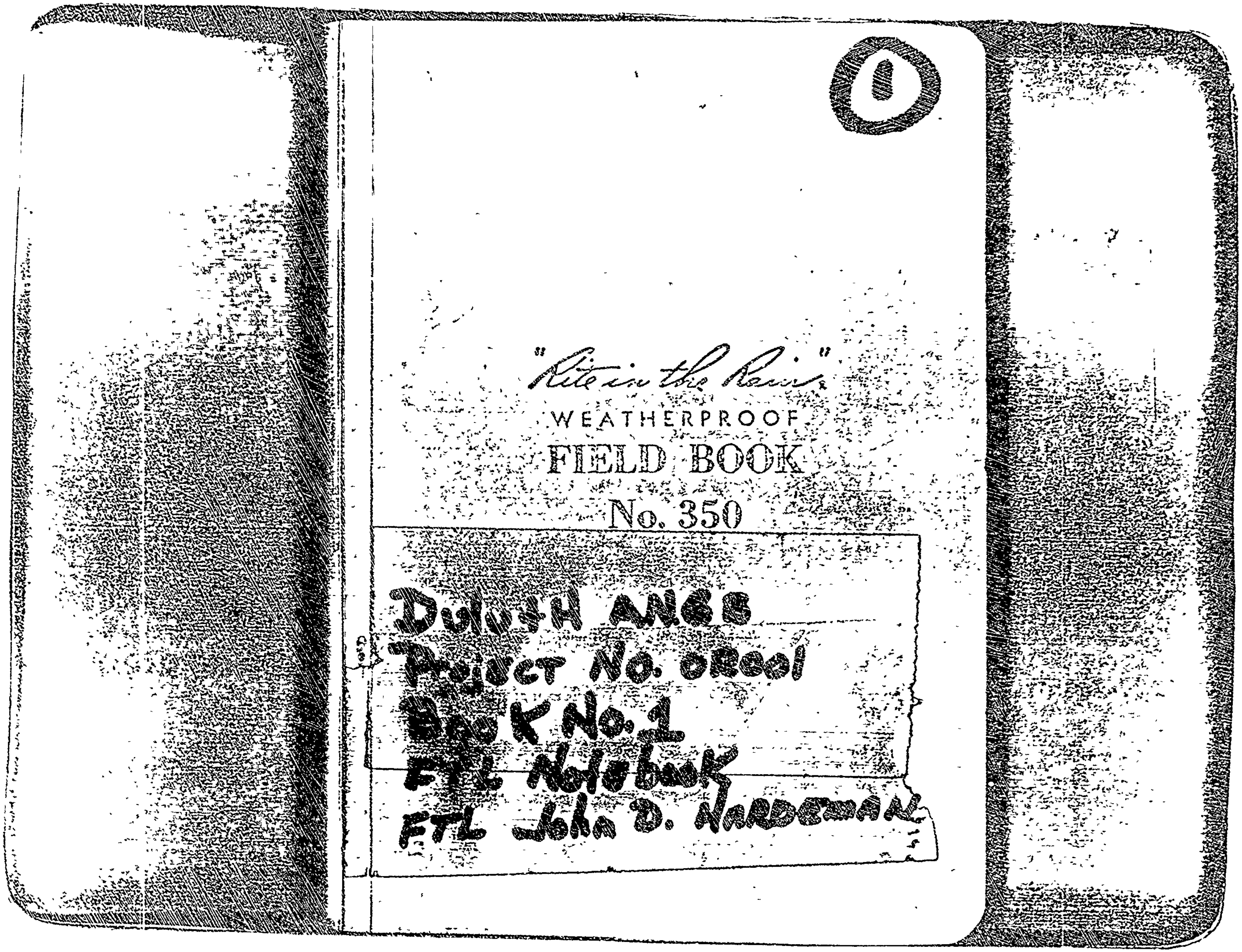
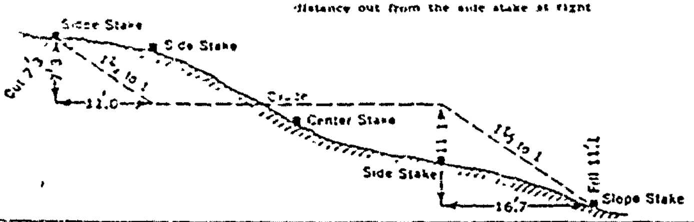

1
"Rite in the Rain"
WEATHERPROOF
FIELD BOOK
No. 350
Duluth ANGB
Project No. OR001
Book No. 1
FTL Notebook
FTL John D. Hardeman

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING
Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7 the distance out from the side stake at right



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
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21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	38.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	33.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

RETURN TO: Robert S. McLeod
Engineering Science
710 S. Illinois Ave.
Suite F-103
Oak Ridge, TN.
37830
(615) 481-3920

Fed Ex # 1196-4207-8

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TACOMA, WASHINGTON 98421 U.S.A.

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CONTACTS

Name		Phone
Maj. Joel D Manns	Duluth ANG	218-723-7290
Col Don Schwold	Hq. Mn Ang	612-296-4673
Sgt Jim Norton	Duluth Ang (CE) (utilities) work control	X 292
Sgt. John Weolund	Facility Mgr. (CE)	X 408
Sgt. Harold STEVENS	supply	X 293
Bill Heyden	ES-Deputy PM	O.R. 615-481-3920
Larry Janssen	HAZWRAP	615-576-1967
Tom STURDIVANT	HAZWRAP	615-482-6601
Enrique Gentzsch	MPCA Site Response	612-296-7823 ~~612-296-7823~~
Elizabeth Gawrys	MPCA Site Response	612-296-7821
ED Grunowald	HS Mgr. ES	404-325-0770
Tom Orthocot	-North Star Drilling	O-612-632-6552
		A-612-632-3306
Melanie Baltizzer	Berkeley Lab	O- 415-841-7353
		H- 415-937-5368
Kathleen Kidd	Berkeley Lab	H- 415-939-7475
Bruce Burke	(utilities (EL) Giv)	218-723-7294
GRAVES (Danny)	Drilling shop	-879-2026
	old shop	624-4344
USGS	Rolano Missouri	314-341-0851
"	Map Archive	703-756-6700
Johnson Well Screen		612 636-3900
Secty		442 X 282
Fire Dept.		X434
Bldg 103		218-723-7470

Page 2

EMERGENCY CONTACTS

BASE Main GATE SECURITY		723-7280
FIRE DEPARTMENT		723-7233
Poison CONTROL		1-800-332-3073
Medical EMERGENCY		
Hospital	ST. Lukes Hospital of Duluth	
Addr.	915 EAST 1st St. Duluth Mn	
Phone	(218) 726-5555	
Base POC	Maj. Joel Manns	
	CE Mn. ANG.	
	W. (218) 723-7290	
	H. (218) 728-2633	
ES		
P.M.	R.S. McLeod	
	E.S. O.R. TN.	(615) 481-3920
Apt. 615-483-4613	Home	(404) 453-9603
HSO	Ed Grunowald	
	ES. ATL. GA.	(404) 325-0770
FAA City Key to GATE		727-2940
		2151

3

Sampling Equipment Utilized

Item	Eqpt.	Asset #	Serial No.
1	HNU PI 101 Field PID	566791	701235
	Probe & Pump	500018	M1144
2	HNU PI 101 Field PID	164716	601288
	Probe & Pump	501288	707031
3	Gastech Explosimeter		CX4994
	Three way gas Alarm		
	GX 82		
4	Biosensor II		C-611-1182
	Explosimeter		
5	Foxboro OVA 128 GC	500452	50654

4

Date: 7-6-88

E.S. Personnel on Site

FTL: John D. Hardeman ES. ATL

Tech: Kim Davis ES OR

Geol: Peter Riemersma ES OR

Tech Soil Eng: Dennis Michead ES Denv

Tech " ": Dan Brookshire ES Denv.

Weather: Hot - Sunny light wind - west

0800 Arrived CE & met Maj. Manns. Received Keys to Hangar 103. Sgt Stevens escorted JDH, KD & PR. to Supply storage to move eqpt. to E.S. Field office

0900 Started transfer of supplies to F.O. uncrated all eqpt. & supplies & inspected content to insure that shipments were complete. S.G. cram calib Eqpt.

1200 Lunch break

1300 Returned from lunch & continued unpacking and

J.D. Hardeman 7/6/88

7-6-88 Cont'd

setting up office. Soil gas crew continued calibration of equip. for primary target compounds. Reviewed Site 3 and established soil gas grid on map w/ refer. to site facilities. Site 3 closed @ ≈ 1530 hrs + access could not be obtained.

1600 Established reference data for M.W. Sites @ FTAs 1 & 2. Also established SS. sites & references on map for Site 8.

1730 Checked operation of site monit. equipment. HNUs & explosimeter. Reviewed operation of equipment using manuals.

1900 Departed site for day.

[signature] 7-6-88

7-7-88 Thursday

ES Personnel on Site

FTL	JD Hardeman
Geol	P. Riemersma
Tech	K. Davis
Tech soil gas	D Michead Den
Tech	D. Brookshire Den

Weather - Sunny - Hot No wind

0730 Arrived Site

0745 H&S Review w/ soil gas personnel, Dennis Michead E.S. Denver is responsible for insuring compliance w/ H&S Plan. H&S Plan acceptance forms signed.

0800 Secured add. field eqpt for field work

0830 Went to office supply store, Engr Supply & Army supply store for eqpt.

1030 Returned to office

1051 Start Flagging site 3

1230 Break for lunch

[signature] 7/7/88

7/7/88 cont'd

1330 Return from lunch

1345 Enrique Gentzsch from NPCA Arrived @ office. Peter & Kim go to Central supply to pick up packages

1405 Kim & Peter return - NPLC water did not arrive. Kim called Fisher scientific & they informed her that they had failed to finalize order. I (John) called B. McLeod to inform him that we did not have water & ask him to locate some & ship to us.

1426 Arrived Site 3 to restart staking & start Soil gas work

1742 Returned to office. Completed locat. of 26 of the 49 soil gas points. Will complete remaining locations on Friday. E. Gentzsch departed site while we were still staking @ site 3 at 1200 hrs. Soil gas crew completed one location and

[signature] 7/7/88

7/7/88 cont'd

were preparing to depart site at 1730 hrs.

1800 hrs. departed field office

[signature] 7/7/88

9

7-8-88 FRIDAY

E.S. Personnel on Site:

FTL. J.D. Harneman

Geol P. Riemersma

Tech K. Davis

Tech SG. D. Muckead

Tech SG. D. Brookshire

Weather Warm - Sl. overcast sl. breez from west.

07:15 Arrived Site & prepared to complete setting SG. locations @ Site 3.

0730 Notified Sgt. J. Norton of CE. that SG. points were set in front of DRMO yard & Requested utility clearance on those Site.

0800 Moved to Site 3 Notified personnel at DRMO we would need access to yard on Saturday & Sunday and that we would need access to field beyond their security fence. They will contact C.E. And security to arrange access for us over the weekend.

[signature] 7/8/88

10

7/8/88 cont'd

0830 Start drilling locations.

0900 CE Arrived to CK utility locations. All points were approved or Relocated to accomodate utilities

1130 Lunch break

1230 Left office to go to A&E office supplies for supplies. Also went to Target & picked up misc cleaning mat'ls.

12/30 Returned to base & went by CE to confirm access to POL - Site 8 & Site 3 over weekend. Maj. Manns informed Security that we would be on base working during entire weekend. Also picked up Key for POL site access & Flight line access.

15:00 Returned to office & called Kathleen Kidd

[signature] 7/8/88

7/8/88 Cont'd

@ Berkeley Lab to inform her of Sample shipment times & schedule & also discuss analysis to be run. Lab was concerned about holding time on Volatile for Soils. She confirmed Labs ability to run multiple samples. She does not anticipate problem w/ holding times

1530 Called North Star drilling to discuss drill procedures, Specif. & anticipated time table for Duluth Field Activities

1630 Returned to Site 3. Flagged S.G. sites along taxiway.

1800 DEPARTED Site for day.

J Hardeman 7-8-88

7-9-88 SATURDAY

E.S. Personnel
JD HARDEMAN
P. Riemersma
K. DAVIS
Dennis Mickead
DAN Brookshire

Weather Clear, Sunny WARM
Wind Calm

0745 Arrived Site. Checked Keys to DRMO Gate. Key did not fit. Also checked mag. Keys to POL site. These did fit but could not gain access to DRMO from this site.

0810 Arrived office & Called CE Fire Dept. to open gate for Soil gas Crew

0830 Began Flagging Site 3

1030 Completed Site 3
Began Flagging Site 8

1115 Completed Site 8 and

J Hardeman 7/9/88

7/9/88 Cont'd

Began gathering mat'ls & data to set monitoring wells.

1145 Lunch

1245 Returned from lunch.

1300 Proceeded to FTA's 1+2 to stake monitoring well locations. Completed locations for WP 1,2,3.

1800 Departed Site

JL Harden 7-9-88

7-10-88 Sunday

E.S Personnel

JD Hardeman

R. Rienersma

K. Davis

D. Mickead

D. Brookshire

Weather: Clear Sunny Sl. breeze from EAST.

0900 Arrived Site - contacted CE Fire Dept. to open front gate to DRMO. Consulted w/ soil gas crew as to days proposed activities. Have completed 20 soil gas points at this time. The remaining crew will complete locations for monitoring wells at Sites 1, 2, 3, 4 + 8 today. If time permits we will collect some soils at Site 8.

0946 Departed for FTA's 1+2.

1040 Completed locations for FTA 1+2 Started Flagging Site 3, 4 & 8

JD Hardeman 7/10/88

7/10/88 Cont'd

1245 Completed Flagging Sites 3, 4 & 8
Break for lunch.
1330 Began Decon on soil sampling eqpt,
Bowls, spoons, Augers etc. Decon
Consisted of liquinox wash,
potable H_2O Rinse, Methanol
Rince, HPLC grade water Rinse.
each item was wrapped in
aluminum foil & stored for use.
1645 Proceeded to site & to
Collect Soil Samples.
1700 Colled Sample DANG 8-B3
Matl Consist of gl. fill, sand
silt & clays w/ abdt pebbles
up to 2" in diameter. Auger
bucket distorted, Rods will
not take abuse. At 1.5' hit
a sandy silty clay w/ few
pebbles, damp.
1720 Decon'ed hand Auger.
1730 DANG 8-A3. Soil very hard w/
large pebbles - Cobbles, started
3 holes could not penetrate
over 6". Will discontinue &

[signature] 7/10/88

7/10/88 Cont'd

Attempt to find a new method.
1800hrs. Departed site.

[signature] 7-10-88

17

7-11-88 Monday

E.S. Personnel

JD Hardiman

K. Davis

P. Riemersma

D. Mickead

D. Brookshire

Weather - overcast - Cool wind from west ≅ 10K.

0730 Arrived Site. Went to Knox Lumber & bought Post hole diggers & wrecking bar. will attempt one hole in area before sampling.

0815 Arrived Site 8 attempted to use post hole diggers to sample. Cannot penetrate mat'l. Will rent power Auger w/ two Augers & head.

0930 Rented Power Auger, sand blasted Augers to Remove Rust, Paint And other residue.

Gil Hardiman 7/11/88

18

7-11-88 (Cont'd)

0945 - Kim set up decon area at Site 3. Decon Power Augers. Decon consists of prewash to remove gross dirt, Alconox wash w/ heavy brush, Dual potable water Rinse, Methanol Rinse and final Rinse w/ HPLC grade water.

1000 Started 1st hole. Power auger work well in soils. will Auger All holes to 1.5' below the major conglomerate soil. Will then return w/ SS hand Augers & bore to 2' & pull sample below area of penetration of power Auger. Drilled hole DAHG 8-C3

Power Auger Drilling:

Time	boring	Auger Decon
1000	DAHG 8-C3	JDH
1010	8-~~d~~ H3	JDH
1020	8-~~d~~ E3	JDH
1040	8-~~d~~ F3	JDH

Gil Hardiman 7/11/88

19

7-11-88 (Cont'd)

Power	Auger holes	
Time	Boring	Auger Decon Cert.
1048	8-B6 F2	
11:54	8-B5 E2	
1105	8 B4 D2	
1110	8 B3 C2	
11 15	8 B2 B2	
1120	8-B1 A2	
1125	8 B0 B3	
1130	8 A0 A3	

1135 Break for lunch & to replace Decon center. Also took post hole diggers & wrecking bar to Mac's Rental + had each item sand blasted to remove paint

1330 Returned to site began Augering

1340	8 - A1	
1335	8 - B1	
1405	8 - C1	
1430	8 - D1	

Recoil spring broke on Auger motor

7/11/88

20

7-11-88 Cont'd

Return to rental Co. to fix spring. Peter & Kim will clean boreholes for sampling.

1535 Motor Fixed - Returned to site & to complete borings. Clouds gathering rain possible. will collect samples as borings open.

Time		Decon
1606	Sampled DANG-8-SS-A-3	
1620	Sampled DANG-8-SS-C3	
1630	Decon'ed Sampling tools	
1647	Sampled DANG-8-SS-D3	
1651	Sampled DANG-8-SS-E3	

Soil sampling - sampling packaging and Decon being completed concurrently.

Samples collected by JDH

Samples bottled by PK

Decon completed by KB

Sample time	Location ID	Decon. Verif.
1700	DANG-8-SS-F3	
1705	DANG-8-SS-A2	JDH
1719	DANG-8-SS-B2	JDH
1725	DANG-8-SS-C2	JDH

7/11/88

21 7/11/88 Cont'd

~~Decon Verif~~ [initials] 7/11/88

Sample time	Location ID	Decon Verif
1233	DANE 8-SS-D2	JDH
1233	DANE-8-SS-G2	JDH
	Duplicate of 8-D2	

Sampling Complete for the day. Samples Refrigerated.

1830 Called Beckley Lab & Informed M. Baltimore that samples would be shipped 7/12/88 for 7/13/88 arrival. shipment confirmed & will not cause lab to ~~be~~ JDH 7/11/88 miss holding time

1845 Departed office

J. Harden 7/11/88

22

7-12-88 Tuesday

ES Personnel.
J.D. Hardeman
P. Riemersma
K. Davis
D. Mcleod
D. Brookshire

Weather - Clear, Sunny, Warm wind ≈ 5K from EAST

0800 Arrived office - B. McLead Called. Discussed progress of SG crew & sampling @ site 8. SG will be complete today. Additional points should be complete by 7-13-88. will include points to A.P. Property west side of field. Prepared decon mat'ls to sample @ site 8.

0915 Moved to site 8 to begin sampling

Time	Location ID	Decon Verif
0932	DANG-8-SS-E2	[initials]
0944	DANG-8-SS-F2	[initials]

J. Harden 7/12/88

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7-12-88 Cont'd.

Time	Location & ID	Decon Verif.
0955	DANG-8-SS-FZ1	[signature]
1005 IEIC / 1021 7-12-88	DANG-8-SS-G1 (Dup of E1)	Peter Riemersma
1021	DANG-8-SS-E1	Peter Riemersma
1049	DANG-8-SS-D1	Peter Riemersma
1104	DANG-8-SS-C1	Peter Riemersma
1116	DANG-8-SS-B1	Peter Riemersma
1131	DANG-8-SS-A1	Peter Riemersma

1200 Lunch

1237 Return from lunch & completed borings w/ power Auger

1230	Dang 8-SS-A0	[signature]
1242	Dang 8-SS-B0	[signature]
1258	Dang 8-SS-C0	[signature]
1305	Dang 8-SS-D0	[signature]
1315	Dang 8-SS-E0	[signature]

@ ~ 1315 Beth Gowey arrived @ soil sampling site. Explained procedure being used and justification. @ ~ 1325 she departed site 8 for lunch

1330 DANG 8-SS-F0

Soil Augering Complete. Started soil sampling @ each Auger locat.

[signature] 7/12/88

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7/12/88 Cont'd

Time of ~~13:35~~ 13:55	Location & ID	Decon Certif.
13:35	DANG-8-SS-A0	Peter Riemersma
13:35	DANG-8-SS-G0 (Dup A0)	
13:45	DANG-8-SS-B0	JDH
13:55	DANG-8-SS-C0	[signature]
13:56	DANG-8-SS-D0	JDH
13:59	DANG-8-SS-E0	JDH
1405	DANG-8-SS-F0	JDH

Sampling Complete. Start Final Decon on Sampling Tools & Eqpt.

1435 Completed decon. P. Riemersma took one load of equipment back to office. K. Davis stayed on-site with remaining equipment. KLD Also, John Hardeman went to make copies of chain-of-custody @ 1435. KLD

1450: Pete returned. Took rest of equipment to office KLD. Packaged and prepared samples for shipment to the Berkeley Lab. Samples were sealed w/ Elect. tape - Custody seals placed on all bottles, lables checked, wrapped

[signature] 7/12/88

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7/12/88 Cont'd

in bubble pack and packed in disposable coolers. Ice was placed in cooler in dual zip lock bags. Coolers were sealed w/ custody seal, and placed in cardboard shipping containers. Chain of custody for each cooler was placed in a zip lock bag & taped to the inside of the cooler lid

1630 Soil gas Crew and Beth Graves (MPCA) arrived @ office. We reviewed soil gas data of selected locations for additional soil gas samples. Crew returned to Site 3 to collect additional samples.

1730 Departed office to take samples to Fed Ex

1800 Left Fed Ex office & departed site for the day.

J. Hardeman 7/12/88

26

7-13-88 Wednesday

ES Personnel

J.D. Hardeman

P. Riemersma

K. Davis

D. Michaud

D. Brookshire

weather - overcast high humidity, rain overnight wi [illegible] calm.

0800 Arrived office. Soil gas crew preparing to conduct soil gas probes on flight line. Sgt. Dennis of CE will escort crew. P.R. and K.D. will aid J.G. crew w/ additional probe in an attempt to complete Site 3. JDH will prepare maps for CE to approve soil boring + MW. locations.

1130 Lunch

1230 Returned from lunch. Soil gas crew still @ Site 3 will

J. Hardeman 7/13/88

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try to complete site by 1400.

1420 Soil gas Crew Returned to office.
Beth C. (MPCA) w/ crew. All
additional sites complete. B. Galuep
confirmed completion of site & stated
that sufficient data had been
collected to adequately describe
site. When asked if she would
like to see and addit. site
sampled she commented that she
knew of no other locations that
she wanted sampled. She departed site
~~1445~~ @ 1440 hrs

1445 Went to CE to get aerial
photos to take to B. McLeod &
J. Duncan.

1600 Returned to Bldg 103. SG crew
have departed site for Denver
office.

1630 P. Reinersman & K Davis left
site to return generator to Rental
Co. for S.G. Crew

1730 DEPARTED Site.

7/13/88

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7-14-88

DEPARTED Site 7-14-88 for
Atlanta. Will Return to site and
mobilize for Drilling Activities
on 7-25-88

7-14-88

7-25-88

1030 Arrived Duluth A.P. w. Ed Grundwald, H&S office from Atlanta Ga. Went directly to CE to notify them that field Activities would begin w/mobilization today & drilling would begin 7-26 or 7-27-88 After initial decon & setup. Also picked up supplies from CE that had arrived during our absence.

1100 JDH & EG went to Knox bldg matls to pick up elect. Cable for power at decon pad & Returned to Bldg 103 to await arrival of North Star Drilling.

1230 Lunch PR & KD arrived from Knoxville

1315 Returned - Graves drilling Rig parked at west gate of bldg 103.

1410 Telephone Co Representative Came by office. Took telephone Rep. around to sites 3, 4 & 8 & showed him all planned

7/25/88

holes. Clearances will be Ready by 7/26/88.

1530 Danny Graves arrived w/ last load of Supplies from his office. Tom Oouthoudt called & said all his supplies had not arrived. He planned to get supplies in & arrive Duluth late on 7-25-88. Will meet at Site morning of 7-26-88.

1630 Departed Site

[signature] 7/25/88

7-26-88 Tuesday

E.S. Personnel on Site
JD Hardeman FTL
ED Grundwald H-S officer
P. Riemersma Geol.
K. Davis.
Weather clear cool slight breeze from Southwest.

0730 Arrived Hanger 103 & began Reviewing project Mat'l. Ed prepared to give Health & Safety briefing. Kim & Peter decontaminating decon supplies. S.S. Sprayers & buckets
JH 7/26/88

08 00 Sgt Dennis arrived & requested that we establish MW location @ Site 2 between taxiway & Runway. While away Tom Oothoudt from North Star drilling & crew Arrived.
North Star drilling crew
1) Tom Oothoudt owner
2) Bill Erickson H&S Supervisor
3) John Anderson Driller

J.D. Hardeman 7/26/88

7/26/88 Cont'd

0830 North Star drilling crew began organizing decon pad area and preparing to set up for drilling. Graves drilling crew due to arrive site ≈ 1100 for H&S briefing

1030 Graves drilling crew arriving Danny Graves due ≈ 1100.

1100 Started H&S briefing conducted by ED Grundwald HSO from Atlanta GA.
Personnel present
Engineering Science
1) JD Hardeman
2) P. Riemersma
3) K. Davis
North Star Drilling
1) T. Oothoudt owner
2) B. Erickson HSO
3) J. Anderson Driller
Graves Drilling
1) D. Graves owner
2) Jeff Osland Driller
3) Mike Edwards Deron

J.D. Hardeman 7/26/88

7/24/88 Cont'd

4) Paul Kilpela Helper

1150 H & S Briefing complete

1200 Lunch

1300 Returned to Airport to pick up JoAnn. Tom Sturdivant did not arrive

1330 To CE to pick up Fedex packages & returned to office @ 1350

1400 Returned to Airport & picked up T. Sturdivant E. Grondwald left site on flight @ 1415. Drillers started entry decontamination on drill Rig.

1435 Returned to Bldg 103. Representative from Culligan was completing installation on Millipore System.

1530 Went to CE to get Keys to existing monitor wells for water level measurements. J. Mason & Capt Nemani not available. Sgt Norton would

J. Harden 7/24/88

7/24/88 Cont'd

try to locate Keys & have them available tomorrow.

1615 Returned to Bldg 103. Released JoAnn & Kimberly for the day. Peter & I will remain w/ Decon Crew until Rig complete. Drill Rig is extremely dirty & decon will be lengthy. Detailed decon Notes are logged in log book Rig 1.

1830 Water pressure dropping at water hydrant. Pressure too low to supply steam cleaner. Hose pressure loss is due to peak usage by surrounding civilian population. Decided to discontinue decon until 7/27/88 AM. If pressure is still too low w/ discuss w/ CE to find alternate Source.

1900 Departed Site.

J. Harden 7/24/88

7-27-88 Wednesday

E.S. Personnel on Site

J.D. Hardeman FTL

F. Riemersma Geol.

J. Sherwin Geol.

K. Davis Eng

Martin Marietta Representative

Dennis Forsberg MM Auditor

Tom Sturdivan M.M Hydrogeologist

Subcontract Personnel on Site

North Star Drilling

Tom Dothardt owner

Bill Erickson HSO

John Anderson Driller

Graves Drilling

Danny Graves owner

Jeff Osland Driller

Mike Edwards Deco

Paul Kilpela Helper

Weather clear with slight breeze from west.

Days Activities will consist of decon of drilling equipment & Supplies. Water levels will be taken and recorded

J.D. Hardeman 7/27/88

7/27/88 Cont'd

on existing monitoring wells. If decon procedures are complete we will begin collecting soil samples @ Site 2.

0710 JDH arrived site w/ drillers North Star on site for Deco

0730 Peter, Kim & Jo Ann arrive site.

0745 T. Sturdivan + Dennis F. arrived site. Prepared K.D. + J.S. to collect water levels. Tom Sturdivan & Dennis Forsberg reviewed decon of Rig. Recommended that rubber connector on Millicale system. Decontamination completed by Peter Riemersma.

0830 JDH, T.S. & D.F. went to CE & met w/ Capt. Nemmi for web meeting also picked up Key for existing monitor well & Key for POL.

J.D. Hardeman 7/27/88

7/27/88 Cont'd

Sgt Dennie inquired about above ground construction of wells next to taxiway. Is concerned about planes hitting above ground construction. Potential for damage to structures & plane if hit by plane. Sgt Dennie also expressed concern about FAA. Dennie w/ contact FAA & discuss above ground construction.

0945 Returned to Hangar 103 & Calibrated HNu. K.D. & J.S. will start water levels after calibration. Headspace on each well will be measured upon opening.

1045 Arrived Site 2 located drums - Hydraulic & Cleansers.

1054 Sgt Dennie arrived Site 2 & informed us that FAA requires that well pts will be min of 75' from edge

J.L. Hardena 7/27/88

of taxiway based on max. aircraft wingspan landing @ Facility which is 747. 118' ½ wingspan - 37½ for ½ taxiway min distance approved by FAA will be 75'. Additionally any permanent structure will have to have construction permits. Also any above ground structure w/in 500 ft has to have breakaway couplings.

1115 Began OJT for K Davis & J. Scherwin for water levels. Did measurements on ~~AM~~ 7/27/88 GW 2E & GW 2D.

1155 Complete OJT & break for lunch @ 12:30 after checking CE for Mail.

1400 Returned from Lunch Checked Augers after sandblasting. Grout left in Augers. Return to Sandblaster for completion. K. Davis decontaminating water level indicator

J.L. Hardena 7/27/88

7/27/88 Cont'd

as per WORK plan specs.

1500 Met w/ Sgt Dennis @ CE about permitting by FAA. Details unclear about what is required. Will meet w/ Dennis @ ≈ 815 7-28-88 & talk w/ FAA to get details.

1530 Left dennis office & went to Site 2 to check on KD + J.S. progress w/ water levels. Identification of wells difficult, locations incorrect. JDH & J.S. Relocated & identified wells prior to W.L. measurement. J.S. & KD will spend the rest of the afternoon accurately locating wells.

1730 Left site 2 to return to Bldg 103. Drill rig developed hydraulic leaks around rear jack cylinder. Tom Sturdivant of Martin Marietta suggested we use ½ 55 gallon drums w/ kitty liter under jacks to catch & absorb flow of hydraulics

7/27/88 Cont'd

Dennis Forsberg also agreed rig will need additional Decon beneath the rear mast.

1745 Tom Sturdivant & Dennis Forsberg depart Site.

1830 JDH + Peter K. depart Site. Driller still decoming rig.

J. Hardeman 7/27/88

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7/28/88 Thursday

ES Personnel on Site

ID Hardeman

J. Sherwin

P. Riemersma

R. Davis

North Star Drilling

John Anderson

Bill Erickson

Graves Drilling

Mike Edwards

Martin Arcietta - Dennis Forsburg & Tom Sturdivant

Weather Clear, breezy, hot.

0700 Arrive Bldg 103 to organize days activities. Will complete decon activities & start drilling activities.

0715 John Anderson arrived office to discuss Rig. Control lever hydraulics on back of rig are leaking. Unsure about volume & if it will effect QA/QC during drilling. Will check w/ Tom Wothoudt about bringing All terrain

JD Harden 7/28/88

42

7/25/88

vehicle in.

0725 B. McLeod called. Relayed situation w/ FAA permitting procedures. Will meet w/ Maj. Manns this AM to discuss permitting procedures.

0740 J. Sherwin & R. Davis arrive. Sent to collect H_2O levels in all existing wells.

0830 Arrive CE. Discuss situation w/ Maj. Manns & Capt Neuman. FAA requires dwgs & structure locations. We requested copies of maps w/ required buffer from runway. FAA Regs require 750' from ℄ of RW for perm strs. which may be waived to 500' by FAA. Additionally requirement for largest plane using facility which is 747 has 118' wingspan. FAA Category IV Fixed or movable object from ℄ on taxiway $118' - \frac{75'}{2} = 81'$ from edge of taxiway

JD Harden 7/28/88

43.

7/28/88 Cont'd

Maj Manns placed buffer on base plat for each runway. Both buffers 500' and 750'. All wells south of Site 2 fall within 750' buffer + three fall within 500' buffer. Maj Manns will take plat to FAA & Cadastral.

1000 Return to Bldg 103. Reviewed fld. procedures w/ Dennis F & Tom Sturdivant. Dennis departed site ≈ 1015 to catch flight home.

1115 Talked w/ Sgt. Dennie. Will meet personnel from FAA who are familiar w/ FTA: Site 2

1120 Lunch

1200 Returned from lunch to wait on Sgt Dennie.

1230 Sgt Dennie arrived & TJ & JDH left to meet FAA personnel. Met w/ Jim Ragan & Dan Campbell of FAA. FTA 1 was uncovered during construction work ≈ 1980. Site is located

7/28/88 Cont'd 44

closer to Runway N32°E than originally thought. Walked site & found area thought to be old FTA. Some stress vegetation that may be due to old burn area. Pit is thought to be ≈ 20' below ground surface. Prior to doing soil borings in this area we will uncover w/ backhoe to locate. Also JDH 7/28/88 told by Mr. Ragan that some aerial photos may still exist that were taken by Mr. Wayne Gatlin former Commander of ANG @ Duluth. Also Kenny Winburg of ~~FAA for City now~~ Airport Authority City of Duluth JDH 7/28/88 may have some photos. Also old aerial photo on wall of Old Terminal @ FAA.

1330 Stopped by FAA to check aerial photos. Photo does not show old FTA. Talked to current FAA director about

JDH 7/28/88

45

7/28/88 Contd

permits of wells along taxiway at Site 4 & 8. Told us that plans & written description would have to be forwarded to FAA for permit is Approx. permit time 90 days. Also stated that all above ground strs. were required to have break away bases. no known exceptions. Site 2 may be excepted due to 500' from nearest Runway & that area sits upon hill. Will discuss results of conv. w/ Bob McLeod.

1425 Called B. McLeod & relayed conversation w/ FAA.

1520 Maj Manus called & said that Kenny Winburg of City had no problems w/ strs @ site 2 outside 500' buffer but Maj. Manus believes that FAA approval is still needed. Agreed to meet

[signature] 7/28/88

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7/28/88 Contd

w/ Maj Manus, Mr. Winburg & FAA official at office @ bldg 103 @0830 on 7/29/88 to discuss Site 2.

1600 Began preparing eqpt & sampling mat'l for drilling tomorrow. Rig decon'ed & Augers returned from Sand blasting. Hydraulics on rig control panel leaks fixed by driller. Will begin drilling 7/29/88.

1800 Checked w/ driller on time for start up 7/29/88. Will meet @ 0700 & start @ Site 2. Will do 2 soil borings & possibly W.Pts.

1830 JoAnn & Kim return from taking water levels. Indicator quit working. probably battery dead. Will complete levels on 7/29/88.

1840 Depart Site.

[signature] 7/28/88

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7/29/88 FRIDAY

E.S. Personnel on Site
D. HARDEMAN
J. Sherwin
P. Riemersma
K. DAVIS

NORTH STAR Drilling
John Anderson
Bill Erickson

Graves Drilling
Mike Edwards
Jeff Osland

0640 Arrived Site. P. Riemersma @ office. Began loading van w/ sampling supplies & Eqpt. Will send J. Sherwin to complete H2O levels alone & let K. Davis work with P. Riemersma on Rig while I attend meeting w/ Maj Manns & FAA.

0730 J. Sherwin depart bldg 103 for Site 4.

D. Hardeman 7/29/88

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7/29/88 Cont'd

0800 Checked w/ driller on anticipated time of depart. No rope for 140 # hammer. As soon as a rope is found they can depart for Site 2. While waiting the ATV Rig is on Site & crew is steam cleaning.

0830 Maj. Manns Arrive

0850 Kenny Winburg from Cty Airport Authority arrive & Maj Manns depart. Mr Winburg confirms drilling @ Site 2 outside 500' buffer. No other authorization needed. @ Site 4 along taxiway Mr. Winburg wants FAA approval before wells are constructed. However he feels that 500 buffer is adequate in that area.

0905 Mr. Winburg departs to get manual showing standard construction set backs for.

D. Hardeman 7/29/88

FAA will return ≈ 0930

1100 FAA has not show up must get to drill site 2 & start work will try to contact FAA later.

1130 Arrive Site 2. No water truck will wait for remaining eqpt

1245 Still no H_2O truck will go to CE to see Maj Marks.

1300 At CE Talked to Sgt. Dennie. FAA has sent map thru CE. Must maintain 750' setback on ~~most Runways~~ NE Runway & 1050 on E-W Runway & 300' on NW-SE Runway. This eliminates all proposed drilling south of Roadway @ site 1.

1315 At Site 2. Start Drilling. All Remaining Notes in log book for Rig 1.

~~1430~~ 1430 Kim Davis left to take J. Sherwin to catch flight home

2/29/88

1500 K. Davis Returns & helps on Rig 1.

1715 Thunderstorm start. Suspend drilling until 2/30/88. Prepare samples for Fed Ex shipment to CA. lab.

1745 At Bldg 103 help R. Riemersma ~~decn~~ decon eqpt for tomorrows work.

1800 Depart Site for Day.

2/29/88

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7/30/88 Saturday

Personnel on Site

E.S.

J.D. Harseman

P. Riemersma

K. Davis

Drillers

Bill Erickson

John Anderson

Mike Edwards

Jeff Osland

~~Paul~~ Kilpela

D. Graves

Weather Sunny Clear Wind ≈ 15 K from west

0630 Arrived office w/ P.R. + K.D. loaded van to go to drill site.

0705 Arrived Site 2 set up Decon area, Drillers preparing to drill.

0745 Started Drilling continuation of BH1

0810 Hammer on rig broke will repair & continue drilling.

JH 7/30/88

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7/30/88 cont'd

0920 Hammer repaired Continue drilling

1122 BT @ 16' Auger Refusal will break for lunch after breaking down rig.

1300 Return from lunch set up on BH2

JH 7/30/88 1616 will discontinue drilling @ 20' until Monday Rig setting on boulder cannot get split spoon down hole. Will try to remove boulder Monday AM.

1630 K.D. Takes samples to Fed Ex. JDH & P.R. return to office unload trucks & prepare to decon on Monday

1720 Depart 103

JH 7/30/88

53 8/1/88 Monday

EU Personnel
JD Heermann
F. Riemensa
K. Davis

Crew
Danny Graves
Jeff Osland
Mike Edwards.

Weather overcast windy ~ 15 K from west - some showers.

0603 Arrive office prepare paperwork & Decon field Eqpt.
0710 Arrive site 2 Drillers prepare to start drilling. Will try to remove boulder
0750 Complete BH2 Site 2, Auger Refusal @ 21.1
0830 Setup well point six site 2 JDH to Bldg 103 to check ATU Rig.
0850 Sgt Schmidt from OEHL & from Woodward Clyde

JL Harder 8/1/88

8/1/88 Cont'd 54

arrive office Woodward Clyde
Brought sampling mat'l & supplies was stored there.
1000 Returned to Site 2 Drilling on BH2 Bored 1st hole to 10' And abandoned Hole Hit boulder @ 10' Moved rig ~ 7' to west & redrilled hole started sampling 2nd hole @ 10'
1100 Moved Rig to 2nd hole @ WP6. Break for lunch before continue boring.
1130 Break for lunch.
1230 Returned from lunch. Continued WP6. Hit H_2O @ 10.5'. Completed boring to 21' 17'
1500 Cannot set well w/o tremie. Driller left site to get tremie pipe. JDH left site to go to CE.
1515 Talked to Maj Manns

JL Harder 8/1/88

Gil Harden 8/1/88 Cont'd

about FAA Permit, will try to set up appt w/ Kenny Winburg for Tuesday A.M. Went to Airport to See K. Winburg: Out of office. Also talked to Maj Manus. about Woodward Clyde sharing our office space. He will try to relocate their sampling team.

1200 Returned to Site 2. Skeet shooters shooting in our general direction. broke down site because of unsafe area. Moved to FTA to grout boreholes.

1800 Started grouting boreholes. JDH Departed Site to go meet R. McLeod at Airport. P. Riemma & JoAnn S. will remain w/ Driller.

Gil Harden 8/1/88

8/2/88 Tuesday

Personnel on Site

E.S.

R. McLeod

J. Harcomai

A. Rieversma

K. Davis

J. S.

Drillers

Denny Graves

Jeff Oslund

Mike Edwards

John Anderson

Bill Erickson

Weather Cool, overcast, windy from west.

will complete well Points on Site 2. Grout boreholes & continue well points

0645 R. McLeod & JDH arrived office. KD, AR & J.S. at office preparing to go to field. LT Schmidt &

Gil Harden 8/2/88

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8/2/88 Cont'd

Woodward Clyde personnel on Site.

0730 Kim Peter & Jo Ann went to Site 2. Kim & Jo Ann will Survey in all wells at all sites. JDH EEM went to J. Manns office to discuss meeting w/ Airport Board & FAA.

0800 Arrived Site 2 driller not on site. Returned to Bldg 103 to check on North Site. Met driller coming out.

0900 Drilling still not started. Danny & Bill left site to pick up glue for PVC prepared to set well. Pulled augers ≈ 2' off bottom to set sand base. Mud in Augers. Tried unsuccessfully to bail. Knocked plug out of base mud & gravel flowed in to well base. Reexamined well, auger casing too crooked. Decided to drill new well.

1035 Move ATU Rig to new hole

J.M. Hardiman 8/2/88

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8/2/88 Cont'd

ATU Auger Rig not heavy enough to penetrate or move boulders in matl. Will use Rotosonic Rig on site & drill w/ it.

1130 Lunch

1230 Ret.

1300 On site 2 waiting on Rotosonic Rig. Driller from Canada to arrive ≈ 1300 @ Airport

1500 go to BH1 & 2 & complete grouting of BH 2. Enrico Gentzel from MPCA Arrives on site.

1530 Complete grouting. Still waiting on Driller.

1645 Heavy Thunderstorm will discontinue for day. Depart Site

J.M. Hardiman 8/2/88

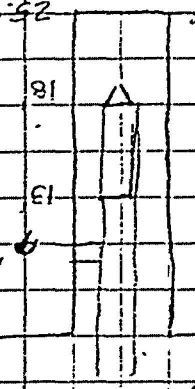
8-3-88 WEDNESDAY
Personnel on Site
E.S.
R. McLeod
J. Hardeman
A. Pierson
J. Shiver
Drillers
Bill Erickson
Jeff Aasland
John Anderson
Paul Kilpela
Jim HNATISHIN
Weather Sunny Clear No wind

0645 Arrived office prepare to go to Site 2
0725 Arrived Site 2. Setup w/ roto-sonic drill begin drilling. WP-6
0800 Air Regulator malfunction will replace before continuing
0900 John Anderson returned site w/ Regulator. Adapter would not work more parts needed.

J. Harden 8/3/88 59

8/3/88 60

0830 John A + Jim H. returns w/ Regulator parts, Repair Reg. STARTED Drilling
Drilled to 25' & cased
1100 Completed drilling
1130 Lunch
1230 Return from lunch & set well
31.9' from turntable
− 6.5' from Top of Ground
25.4' T.D.
Will set screen @ 18'
18'
+6.5
24.5' to turntable



J. Harden 8/3/88

8/3/88 cont'd

1515 Complete sand pack to 9' bgs. setting up to pump bentonite slurry

1600 ~~Grouting~~ Bentonite Seal Set.

1730 Depart Site will set up on deep well @ GW20 on 8-4-88.

J. Hardin 8/3/88

8/4/88 Thursday

Personnel on Site

R. McLeod

J. Hardin

R. Richardson

J. Sherwin

K. Davis

Drillers

Bill Erickson

J. Anderson

Jim Hnatishin

D. Grane

M. Edwards

Jeff Axelund

weather Raining wind gusting ≈ 30K from west.

0650 Arrive office w/ R.M. help Peter get ready to go to field.

0715 Met J. Anderson + Jim H. @ Site 2. Raining hard, John will try to fix a tarp for rear of Rig. will try to drill ≈ 1000

J. Hardin 8/4/88

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8/4/88 Cont'd

J. Hardeman + Em to CE.
Develop corrected map and construction (Rev 4/1/88) diagrams for Major Hayes to take to Kenny Winburg.

0930 Return to bldg 103. adjust boring locations @ Site 3 + 4.

1030 Return to Site 2. Began digging test pits w/ Backhoe for FTA-1. Began in area where FAA employees said that contam. w/ encountered during grading. No contamin found w/ backhoe

1245 Complete backhoe work leave for lunch @ 1300

1425 Return from lunch

1445 Began drilling Drng 2 - MW12.

1500 R. McLeod left site to catch plane home.

1621 BT @ MW12 TD 23' Adjacent well MW2E is presently screened @ bedrock: this well will be abandoned. Boring will be grouted to surface.

J. Hardeman 8/4/88

64.

8/4/88 Cont'd

Grain size analysis samples selected. 5 samples taken in channel throughout total aquifer thickness.

1710 Departed site for office.
1750 Arrive office
1800 Departed site for day

J. Hardeman 8/4/88

8/5/88 Friday

0635 Arrive office
Personnel on Site
J. Hardeman
P. Riemenschneider
J. Sherwin
K. Davis
Drillers
B. Erickson
J. Anderson
J. HNATISHIN
J. Aslund
M. Edwards
P. Kilpela

Weather overcast - raining windy from west.

0700 Depart office for Site 2.
0710 Arrive Site 2. Setup on Site 2 MW 13. adjacent to GWRA.
J. Sherwin will complete heat pit for ETA.

J.L. Hardeman 8/6/88.

8/5/88 Cont'd

0900 Complete MW 13 BT @ Adjacent to well MW 2A Screened to bedrock.
MW 13 will be Abandoned.
1000 Remove drill & return to Decon Area. will decon rig & move to Site 8.
1200 Decon Complete - Lunch
1300 Return from lunch set up @ Site 8 MW 18 adjacent to MW 8C
1445 MW 18 Complete Bedrock encountered @ ≥ base of screen @ MW 8C. the boring will be abandoned
1500 JDH left Site for Airport will depart @ 1600

J.L. Hardeman 8/5/88

.67

8/8/88 Monday

[illegible] 8/8/88

1115 Arrived Duluth Airport & went to Site. Weather Sunny clear slight breeze from west. Drill setup @ Site 8 on MW 15.

Personel on Site

LDH

R. Riemann

R. Davis

J. Sherwin

Driller

Bill Erickson

J. Andrews

J. Ausland

1240 Drilling complete will take water & complete well PM.

1400 Preparing SS casing 2" Johnson schedule 5 type 304

Set casing in well & prepared to sand pack, Battery on drill rig dead. Spent ≈ ½ hr trying to crank rig. will

.68

have to take batteries out & have them recharged. will continue borings & setting well in AM.

1615 Departed Site 8 for office

1630 Departed office

[signature] 8/8/88

69

8/9/88 Tuesday

Personel on Site
J D Harden
P. Riemann
K. Davis
J. Sherwin
Drillers
T. Oothoudt
B. Erickson
J. Anderson
J. Aaslund
D. Cerano

Weather Sunny Clear wind ≈
10-20 K from west.

0630 Arrived office. Prepare to go to Site 8. J.S. & KD will locate all backhoe test pits at Site 2

0700 At Site 2. Prepare to set Sand pack, tremie pipe too large for boring Diameter. we'll have to set up w/ 3/4" tremie.

J D Harden 8/9/88

8/9/88 Cont'd 70

750 Continue Sandpack from 44' to 26.0'

1115 Complete sandpack & place bentonite Slurry Seal

1215 Complete bentonite tremie & begin mixing grout. Mixer broke down.

1245 Start grouting

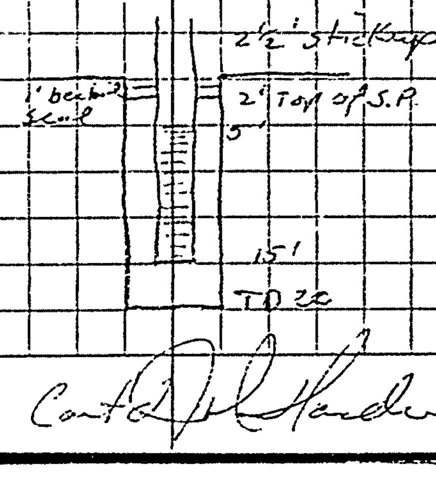
1300 Complete grouting & set Protective Casing ft. below grade.

1330-1430 Decon Drill pipe

1455- Start Drilling 8 MW15

1556- Drilling Compl TD 20'

Started Setting MW15 Construction



8/9/88 Cont'd J D Harden

71 · 5-9-88 Cont'd

1800 Construction MW 15 Complete

Move drill to 8 MW 19

1815 Depart Site

G. Harden 5/9/88

5/10/88 Wednesday

72

Personnel on-site

J. Harden

R. Riemenna

K. Davis

J. Stevens

Driller

Tom Oosthoudt

J. Andrews

Bill Erickson

Weather Sunny Clear Breeze

≅ 10-15 K from South.

0640 Arrive site

0715 Driller pick up Drill rods

0801 Start drilling 8-MW19

0845 TD 13.5' - Adjacent well drilled and set @ 13' at bedrock contact with plug 8-MW19.

0920 Set-up 8 MW 16 & start Drilling

1130 TD 3' into bedrock.

Completed Casing Into bedrock

73 8/10/88 Cont'd.

1200 Lunch
1300 began constructing Casing & Screen & Sandpacking
Screen 10'
Casing 21' Top of Ground
25' stickup
Bentonite Seal 1-2'
Sand Pack 14'
Grout 15'
1534 Complete 8MW 16. move Rig to 8MW 17
1600 Start Drilling 8MW17.
1645 TD 15' 8MW17 will set screen base @ 12'. $H_2O \approx$ 6' BLS.
1700 Began setting well.
Screen 10'
Blank 4.5'
Base Set @ 12'
Sandpack from base to L.S.
1815 Well constr. Complete
1830 Depart Site.

J Hardeman 8/10/88

8/11/88 Thursday 74

Personnel on Site:
JD Hardeman
P. Riemersma
J. Sherwin
K. Davis
Michael Roddy
D Rellers
T. Oothoudt
J. Anderson
B. Erickson

Weather Sl. overcast occ. shower breeze ≈ 5K from west.
0630 Arrive Site all pains eqpt for drill act. will contin daily site 8 & 7.
0720 TO CE to see Bruce @ Utilities for approval on 8WP 5 & 6. Both sites cleared @ 0815.
0830 J.S + M.R move to site 2 to locate FTA 1 w/ B.H.
0900 Move Rig to 8 MW 5 & 6 &

75 8/11/88 Cont'd

set up. GLH 8/11/88 WP-9+9D

0930 Start Drilling @ 8 ~~HW 6+5~~.

Also meet w/ T. Oosthardt to discuss usage of conductor pipe on 1¼ wells & 2" well.

1100 Returned to site completed drilling 8 ~~HW~~ WP 9D @ 1305

1305 lunch

1336 Return from lunch & started completing WP9D - Grout Pump broke down - Repaired pump

1730 Completed WP9D

TD 54'

Screen 5'

Base of Screen @ 50'

Sand pack from 54' to 40'

Grout 38' Surface

Bentonite seal 2'

1875 Started drilling WP93

1904 TD 21' Completed well

Screen 10-15'

Sand pack to 5'

Bentonite Seal 3-5'

Grout to Surface

1950 Depart Site GL Harden 8/11/88

76

8/12/88 Friday

0800 Arrive Site

Personnel on Site

ES

JD Harden

P. Lanimore

K. Davis

M. Roddy

J. Sherwin

Drillers

T. Oosthardt

B. Erickson

J. Anderson

J. Ausland

Weather Overcast Raining wind from west-southwest

Drillers Decon equip to move to site 2 will set up addit. grout truck to help site

09:30 Met w/ T. Oosthardt to complete time sheets

11.00 lunch

1300 Return to office awaiting on driller

GL Harden 8/12/88

72 8/12/88 Cont'd

to complete eqpt repair.

1513 Started Drilling 2 nw 38 TD @ 20' cannot set well @ this location lge boulder @ base will move ≈ 10' ahead & redrill.

1530 J. Shaw ~ Depart site for home.

1656 left site 2 Thunderstorms cannot complete well.

1720 Departed office.

J.D. Harden 8/12/88

8/13/88 Saturday 78

0700 Arrived Site

Personnel

J.D. Harden

P. Riseman

K. Davis

M. Roddy

Driller

J. Anderson

B. Erickson

J. Ashlund

Weather Cloudy, Rain wind from W-SW ≈ 20-30 K.

0720 Started Drilling 2 nw 38 2nd hole TD ≈ 21'

0755 Stopped Drilling because of lightning.

0910 Resumed Drilling

0940 Complete Drilling Start setting wells. Centralizer will not fit well JD # depart site to find SS clamps Driller will screen

J.D. Harden 8/13/88

79

8/13/88 Cont'd

10:40 Returned site Thunder storm
severe. Depart site @ 1200

1200 Return to office to set up eqpt
for Monday - work on computer
for spreadsheets.

1330 Depart site.

J. Harden 8/13/88

80

8/15/88 Monday

Personnel on Site

J. Harden
P. Stevenson
K. Davis
M. Reddy

Driller

J. Anderson
B. Erickson
J. Ashland

weather Sunny - Clear wind from west
~ 5 K.

0730 Start setting well. No. 53
Clamps. J. Ashland & J.D. ...
go to Parts Plus for clamps.

0930 Return to site & complete setting
well 2/mw 38

1100 Complete mw 38
TD 20'
Base of Screen 15 - 5'
Sand 20' to 2'
Bentonite Slurry 0-2'
Casing $7\frac{1}{2}$"

1115 move to 2 mw 37 Driller
take H_2O truck to refill

8/15/88 J. Harden

81 5/15/88 Cont'd

1218 start Drilling MW 37

1335 Complete MW 37 TD 18.5'

Installation

TD 18.5'

screen 5-15'

Sand pack 18.5-2'

Bentonite 0-2'

Move to MW 39

1617 start Drilling MW 39

1849 Complete MW 39

TD 22.5'

Screened 4-14'

SAND PACK 2-22.5'

Bentonite 0-2'

1900 Complete well Constr. & Decon

All SS centralizers & clamps

1915 Depart Site

5/15/88 [signature]

8/16/88 Tuesday 82

Personnel on Site:

JD Hardeman

P. Riemersma

K Davis

J. Sherwin

M. Roddy

Drillers

J. Anderson

B. Erickson

M. Edwards

J. Auslund

D. Graves

- Weather Sunny, warm Breeze West.

- P. Riemersma & K. Davis will Cont[inue] hand drilling @ site 2.

J. Sherwin & M. Roddy will begin Soil Sampling @ Site 3

0635 Arrive Site Prepare Van for work.

0715 Drillers Arrive & complete loading Casing & Drill steel for Site 2

0830 Talked w/ Tom Sturdivant of Hazwrap. Cont[inue]d communication

8/16/88 [signature]

8/16/88 Cont'd

of 8/12/88 Concerning grouting of Borings & MWs. Will grout complete MW with Bentonite Slurry to ground surface as per NMCA Regs. If bentonite shrinks into Annulus will complete w/ Bentonite Cement grout. Also talked to B. McLeod ≈0840 discussed possibility of Demobilizing if [illegible] does not continue funding project. Approx. target of Demob is Saturday 8/20/88. B. McLeod asked me to talk to T. Dothardt & advise that Demob may be required.

0850 Talked to T. Dothardt & informed him that demob may occur & to prepare for possibility.

0900 Moved to Site 2. & Set up on 2MW 40.

0930 Start Drilling 2MW40 [illegible] 8/16/88

1050 Drilling Complete TD ~~25~~ 17

will prepare SS Casing.

12:30 Start compl. on MW 40

8/16/88 [signature]

8/16/88 Cont'd.

TD 17'

Screen 2-17'

SAND PACK 0-17'

1330 Move to 2WP 7+70

1402 START Drilling 2WP 70

1553 TD 2WP 70 @ 29'

Begin Construction:

Screen base @ 27'

SANDPACK 29-15

Bentonite Slurry 0-15'

CASING 15' to 2.5' AG

1900 Construction 2WP 70 Complete

Depart Site.

8/16/88 [signature]

8/17/88 Wednesday

Personnel
- JD Harden
- P. Rieweanna
- R. Davis
- J. Shewi
- M. Roddy

Driller
- T. Oathoudt
- J. Anderson
- B. Ericksen
- M. Edwards

Weather Cloudy, Very windy from East ~ 20 K. Raining possible.

0640 Arrived site began preparing for Day. P. Rieweanna & R. Davis will complete Soil Sampling @ Site 3. J. Shewin & M. Roddy will work with Drill Rig.

0745 Move to Site 2 to complete 2WP 7S. Started Drilling

0900 Complete Drilling 2WP 7S TD 15' Start WP. Const.

J. Harden 8/17/88

8-17-88 Cont'd

	T.D 15'
	Set WP 8-13'
	SANDPACK 15'-3'
	Bentonite Slurry 0-3'
0940	Construction Complete.
	Move to Site 2 MW 41
1045	Set Tom Oathoudt in 2WP 8 to grade area f Rd w/ back hoe.
1115	STARTED Drilling 2MW 41
1210	TD 20.0'
	H_2O est @ 7'
1240	Begin completion of well
	Screen 2-12'
	Sand 0-20'
	Stickup 2.5'
	well set 3 times 1st 2 attempts screen & casing rose ~ 1' cleaned well & reset both times
1505	Complete 2MW 41 & moved to 2WP 8
1605	Started drilling
1727	TD @ ~~16~~ 18' JDH 8/17/88
1735	Begin Constr 2WP 8

8-17-88 J. Harden

8-17-88 Cont'd

TD 18'

WP Base 17'

Sand Pack 18-8'

Bentonite Slurry 0-8'

1807 Constr 2WP8 Complete.

1820 Depart Site 2

J. Harden 8/17/88

8/18/88 Thursday

Personnel

J D Harden

R. Rieversen

M Reddy

K. Davis

J. Skevin

Drillers

J D Anderson

T. Dotterloff

B. Erickson

M. Edwards

J. Asslund

Sunny Clear winds ≈ 20-25 K from S.

0645 Arrived office

0700 To CE to contact J. Denny went to Background site west side of field - Drilling @ site approved

0815 Arrived Hanger 103 Drillers w/ need ATU to access site. Took M. Edwards to site 2 to get ATU

J. Harden 8/18/88

8/18/88 Cont'd

0900 Sit. from utilities arrived to escort drillers to Site

0930 Depart Deco area for Site.

0950 Start drilling

1040 stopped drilling @ 12' was into a Concrete structure, ~ 2'. Stopped drilling to get utilities to check on STR. Will move to miss STR. Moved ~ 20' South.

1114 STARTED Redrilling BG MW 42

1120 Hit Concrete STR @ 4' stopped Drilling & move location

1230 stopped drilling 2½' into bedrock Matl v.v. Hard TD 10½' Hit bedrock @ 7¾' Move to new Location closer to taxiway

1300 STARTED Redrilling

1330 Complete Hole TD 15.5' START Setting well

1245 Well Complete

TD 15.5'

SAnd 15.5-0

Screen 12-2'

Casing 4.5'

[signature] 8/18/88

8/18/88 Cont'd

1500 Move to BG MW 43 & set up.

1540 Begin drilling.

1650 Complete drilling ~~well~~ Complete well

1800 well complete

TD 24'

Base of Screen 20'

SAND 24 - 7'

Bentonite 0-7'

Stick up 2.5'

1802 BACK to Bldg 103

1830 DepART Site

[signature]

91

8/19/88 FRIDAY

Personnel

JD Hardeman
R Riemenn
J Skerwin
M Roddy

Driller

J. Anderson
B. Erickson
M. Edwards
J. Ausland
T. Oothoudt.

Weather Sunny Clear breeze from east ~ 5K

0615 Arrived Office
0650 Calibrated HNU.
Inst # 500791
0730 Tele conv w/ Bob McLeod discuss development procedure & est. completion date for drilling.
0800 Driller to Site to start Drilling
0930 To Site 3 w/ Mike Roddy to take HNU readings on holes

J Hardeman 8/19/88

82

8/19/88 Cont'd

Where Soil Samples taken w/ effect HNU presented readings during Sampling. New holes or cleaned holes w/ be surveyed at this time

Boring No	Time	HNU Reading
58	9:40	0 ppm
54	9:43	0 ppm
A1	9:45	0 ppm
A0	9:47	0 ppm
A2	9:49	0 ppm
A3	9:51	0 ppm
A4	9:53	0 ppm
A5	9:55	0 ppm
B4	9:59	0 ppm
55	10:01	4 ppm
B3	10:04	0 ppm
B2	10:06	0 ppm
B1	10:25	0 ppm
49	10:33	25 ppm
C3	10:35	<1 ppm
C2	10:37	0 ppm

J Hardeman 8/19/88

8/19/88

Boring No	Time	HNU reading
C1	10:42	0 ppm
C0	10:44	0 ppm
D0	10:47	0 ppm
D1	10:49	0 ppm
D2	10:51	0 ppm
E2	10:52	0 ppm
E1	10:53	0 ppm
E0	10:55	0 ppm
D4	10:59	0 ppm
D5	11:02	0 ppm
C5	11:04	0 ppm
S7	11:09	0 ppm
S6	11:11	0 ppm

1115 Back to site 4 WP 11D drillers waiting on clamps for Centralizer. JDH & M.R. pick up lunch for E.S. Crew

1200 Back to site 4

1220 WP11 D Complete will move to 4WP11D near the DPDC & Begin drilling

J.L. Harden 8/19/88

8/19/88

1335 Begin Constr. WP11D Compl 1505

1357 WP11D Complete @ 28.4 ~~WP11D~~ MW23

1405 Begin Construction of ~~WP11D~~ MW23

1505 Construction Complete

1457 Complete drilling ~~WP11D~~ MW23 TD 33'10"

1921 Construction of MW23 Complete

TD 33'10"

Screen 22'6" to 32'6"

Sandpack 18'6" to 33'10"

Bentonite Surface 0-18'6"

2030 Depart Site

J.L. Harden 8/19/88

95

SATURDAY
8/20/88 ~~[illegible]~~ [illegible]

0645 Arrive office
Personnel on Site:
J.D. HARDEMAN
P. Riemer
M. Reddy
J. Shaw
Drillers
John Andrews
Tom Oosthoudt
Bill Erickson
Mike Rasinski
Weather Clear - Warm Breezy from
South = 10-15 K
0750 Start Drilling MW 22 Site 4
P.R., M.R. & J. Shaw - will complete
& install well. J.D. H will work
on Driller log sheet & table.
0330 P.R. Return to office - Drilling Completed
will receive well data &
set well.
TD 35'
Screen 33-23
Sand Pack 35 to 19
[illegible] 0-17
8/20/88 J.D. Harden

96

8/20/88 (cont)
1130 Construction Completed
1130-1230 Move to 4 well 21
1230-1330 Lunch
1340 Start Drilling MW 21
1456 TD 22.5' Left office to
Receive [illegible]
1505 Began Construction
1610 Constr. Complete
TD 27.5' BR @ 15'
Screen 10-20' [illegible]
Sand Pack 6'-~~20'~~ 22.5'
Bentonite 0-6'
1637 Constr Complete & leave Site

J.D. Harden 8/20/88

97

8/22/88 Monday

0640	Arrived office
	Personnel
	JD Hardin
	P. Rosemann
	M Reddy
	L. Shaw
	Drillers
	John Anderson
	B. Emberson
	M. Rinoski
0657	left office to go to CE to request escort for WPs along taxiway
0715	Back to office
0754	Driller ready to drill - still waiting on escort from ANG
0815	Escort Arrives
08??	Start Drilling WP12D
0922	TD 25' Final 3' to be drilled in bedrock cannot retrieve core.
1030	Drilling complete @ 35'
	Begin well construction
	TD 35' Sandpack 21.5-35'
	Screen 23-32' Bentonite 0-21.5'

J.D. Hardin 8/22/88

98

8/22/88 Cont'd

1130-1230	Lunch
1230	Start Drilling WP12S
1310	stop drilling WP12S TD @ 20' & start Construction
1415	Complete WP12S
	Screen 9'10" - 19'10"
	Sand Pack 20-6'
	Bentonite 0-6'
1435	Start drilling WP13D
1520	stop drilling TD 25'
	Start Completion
1619	WP13D Complete & start Drilling WP13S
1635	TD WP13S @ 11'
	Construction
	Screen 5-10' JDH 8/22/88
	Sand ~~[illegible]~~ 2-11'
	Bentonite 0-2
1720	Construction Complete
1740	Depart Site

J.D. Hardin 8/22/88

8/23/88 Tuesday
Present
J.D. Hardeman
R. McLeod
P. Riemann
M. Reddy
J. Skemian
Driller
J. Anderson
B. Erickson
M. Rimsky
J. Hosland
Weather Clear cool w/ breeze --
wind from South to west
0650 Arrive Site Waiting on Escort for driller
0825 Escort Arrived Bldg 103
0835 Start Drilling WP14D
0955 Drilling Complete TD 27.5'
1000 Begin Constr
Screen 20-25'
Sand 16.5-27.5
Bentonite 0-16.5
1032 Constr complete WP14D

J.D. Hardeman 8/23/88

8/23/88 Cont'd
10 45 Set up WP14S
1056 Drilling Complete TD 12'
& Start Construction
TD 12'
Screen 5-10'
Sand 2-12'
Bentonite 0-2'
1124 Complete Construction WP14S
Lunch
1230 Return from lunch Set up to 4WP15D
1242 Start Drilling 4WP15D
1400 TD @ 31'6"
Start well construction
Screen 25'6" to 30'6"
Sand 22'6" to 31'6"
Grout 0-22'6"
1518 Complete Construction of 4WP15D
1540 Start Drilling 4WP15S
1610 Drilling Complete TD 17'
16 15 Begin constr.
Screen 10-15'
SAND PACK 6-17'
Bentonite 0-6'

J.D. Hardeman 8/23/88

101 8/23/88

1642 Const. Complete 4/MW153

1653 Arrive @ MW24 in Pal

1755 Eqpt. shortage cannot drill @ this location the evening.

1800 Depart Site

J.D. Harden 8/23/88

122

8/24/88 Wednesday

Personnel

J.D. Harden

K. McLeod

M. Reddy

J. Shearer

Drilling

T. Outhoudt

J. Andrews

B. Erickson

M. Rasinski

0650 Arrive office weather slightly overcast & cool w/ slight breeze.

0715 T. Outhoudt arrive office to talk w/ K. McLeod & JDH. Drillers ~~Mein~~ JDH 8/24/88 Driller completing cleaning of drilling Eqpts.

0800 Setup on MW24 & Start Drilling

0930 Boring complete TD 37'

1010 Begin well completion

TD 37' Screen 25-35'

Sand 21-37'

Bentonite Grout 0-21'

1135 Well Completed

J.D. Harden 8/24/88

8/24/88 Cont'd

12-1300 lunch

1340 Setup @ 3MW25 area law - Drill & H_2O truck stuck, will relocate hole around existing utilities & drill @ later date

1524 setup @ 3MW27 & start drilling

1605 Drilling Complete TD 15'

1638 start well constr.

TD 15'

Screen 2-12'

SANDPACK 0-15'

1811 3MW27 Complete

1840 depart Site

JD Harden 8/24/88

8/25/88 Thursday

Personnel on Site

JD Harden

R McLeod

M. Roddy

J. Sherwin

Driller

J. Anderson

B. Erickson

M. Ruski

Craig Oothoudt

T. Oothoudt

Weather Clear & Cool, breeze ≈10K from S

0700 Arrive Base

0800 Set up @ 3MW35

0930 drilling Complete TD @ 7.5'

Hole incomplete hit boulder @ 7.5' moved hole ≈ 10' South.

0953 Started Redrill

1025 JDH 8/25/88 14' break in drilling for fuel

1045 Restart drilling

1145 Drilling complete TD 17'

1150-1250 Lunch

JD Harden 8/25/88

5/25/88 Contd.

1250 Begin well Construction 3MW35
TD 17'
Screen 2-12'
SAND 0-17'
Well damaged during Construction
Screen ≈ 6" below grade. well
Reset well.
1405 Begin Reconstruction.
1600 Construction Complete.
1635 Fence replaced along backside
1657 Depart Site

JL Harden 8/25/88

8/26/88 Friday
Personnel
J.D. Harden
M. Roddy
J. Shumin
Driller
J. Anderson
B. Erickson
C. Oothardt
weather clear to P.C. Cool & breezy.

0700 Arrive office M.R. & JDH
well drill news @ Site 3
J. S. will stay w/ C. Oothardt
on development Crew.

0750 Set up on 3MW25.
0902 Drilling Complete TD 18'
0909 Start Construction 3MW25
0948 Constr. Complete
TD 18'
Screen 6-16
SAND 3-18'
Bentonite 0-3'

JL Harden 8/26/88

8/26/88 Cont'd

1010 Start drilling 3MW26
1101 Drilling Complete TD 14.5'
1120 Begin Constr. 3MW26
1150-1200 Get H_2O.
1208-1310 Lunch
1310 Resume Constr.
1350 Constr Complete
TD 14.5'
Screen 2-12
SAND 0-14.5
1410 Drill eqpt to Decon area
to decon steel.
1500 Return from Decon
1524 Set up on 3MW30
1535 Reset up on 3MW30
1557 Start drilling
1645 Drilling Complete
1700 Start Construction. JDH to
Federal Express to deliver
Samples.
TD 17.5
Screen 5-15'
SAND 3-17.5
Bentonite 0-3'
1815 Depart Site

J D Harden 8/26/88

8/27/88 Saturday

Personnel
J D Harden
M. Reddy
J. Skinner
Driller
J Erickson
R. Eiselein
C. Ostlundt
Weather P.C., cool & sl. breezy
from SW.-W.
0700 Arrive Site
0748 Set up @ 3MW31
SS1 & SS2 Collected.
SS3 lost during drilling
No sample @ bedrock
0855 Finish drilling TD 18'
0935 Begin Construction 3MW31
1032 Constr Complete
TD 18'
Screen 5-15'
SAND 3-15'
Bentonite 0-3'
1118 Set-up 3MW38 & Start Drilling
1202 Drilling Complete TD 15'

8/27/88 J D Harden

8/27/88

1225 Begin Castr
TD 15'
Screen 2-12'
SAND 6-15'

12.59 Castr Complete

13 30-1415 lunch

1435 start Drilling 3мш33

1452 Begin Sampling

1600 Drilling Compl TD 24'

1610 JDH Departs Site to
Ed E4

1700 JDH returns

1725 well Castr Complete
TD 24.5'
Screen 12'-22'
SAND 9-24.5'
slurry 0-9'

1735 Depart Site

J.l. Haider 8/27/88

8/28/88 Sunday

1000 Meet T Eckhardt on
site to discuss well
completion & billing

1300 Depart Site

J.l. Haider 8/28/88

111

5/29/88 Monday

Personnel
- J D Harden
- M Reddy
- J Shemi[illegible]

Driller
- C Outhoudt
- J Andrea[illegible]
- B Erickson

Weather Clear to PC Cool Calm Breeze

0640 Arrive Site & begin prep for day. Driller will begin 3 (MW 34) when they arrive. [illegible] & C.O. will develop wells.

0730 Called ATL. Talked to S. Shultz & requested addit'l hand pump on site to help w/ development. Driller still not on site.

0745 Driller Arrive on Site & move to Site 3, set up on MW 34 / Cannot crank drill [illegible]

[signature] 5/29/88

112

5/29/88 Monday

Because of [illegible] [illegible]
& [illegible] [illegible] [illegible]

1200 Drillers [illegible] [illegible] [illegible] [illegible], begin [illegible] on MW34.

1232 Drilling Comp. Begin Constr.
TD 15'
Screen 2-12'
SAND 15-0'
Stickup 4.5' Blank

1348 Constr MW34 Complete

1430 Set up @ MW32

1450 Start Drilling MW32

1558 TD 22.5' Begin Constr
TD 22.5'
Screen 17-7'
SAND 4-22.5'
Bentonite 0-4'
BLANK 6.5'

1753 Constr Compl

1800 Depart site

[signature] 5/29/88

8/30/88 Tuesday

Personnel

J. Harden — B. McLeod

M. Roddy — P. Rein

J. Sherwin

Drillers

C. Oathoudt — M Rasuki

J Anderson — Tim

B. Erickson

Weather Cool, PC, Sl. breeze

0645 Arrive @ office set up crews for day. M. Roddy & J H will continue drilling J. Sherwin w/ work w/ Clay Oathoudt. developing well.

0745 Set up 3MW29 & start drilling had to remove fence @ gate. drilled to 7' & stopped hole, not straight veering off boulder. hole started & stopped 3 times.

0900 Contacted director of DRMO @ Summer in Indiana & advised situation & requested to move hole to east of drmo mons approved.

8/30/88 Jal Harden

8/30/88 Tuesday

0920	Set up across drmo & start drilling
1000	T D 3MW29 @ 16'
1	Begin well Constr.
	Screen 2-12'
	SAND 0-16'
	BLANK 4.5'
1040	Constr Complete
1102	Set up MW30A & start drilling.
~~1127~~	TD 15' & compl Constr.
	TD 15'
	Screen 2-12'
	SAND 0-15'
	BLANK 4.5'
	Constr was completed @ previous date This was Redrill & Resample - Orig Samples Broken
	Set up inside DRMO to collect Samples @ Soil Gas locations
1149 - 1151	SGD3 - 3' depth
1158 - 1200	SGE3 - 3' depth
1200 - 1230	Collected & Bottled Samples

Jal Harden 8/30/88

15 8/30/88 Tuesday

1220 lunch

1310 Return from lunch will Decon Rig & move to Site 2 to Redrill 2BH1 & 2BH2.

1450 Decon Complete & arrive @ Site 2. stopped @ FED EX on way to site.

1505 Set up 2BH2 start drilling

1558 BT TD 27' @ Bedrock

1602 Set up 2BH1 start drilling

1627 BT TD 24.5'

Samples collected from 2BH1 & 2BH2 replace Samples previously collected @ this site lab exceeded Holding times.

1630 Preparing & Packaging Samples for Shipment

1755 To Fed EX.

1855 Complete cleaning in office & Depart site

J D Harden 8/30/88

16

8/31/88 Wednesday

Personnel

JD Hardeman R. Rein

M. Roddy

J Sherwin

Driller:

J Anderson

B. Erickson

G. Oothoudt

M. Razuski

Tim

Weather Cloudy, Cool & Breezy

will complete Drilling & Begin well Completions.

M. Roddy will complete drilling, clean site, JS will Continue development

0758 Start Redrilling MW14-

0820 TD 25'

after Completion of drilling I met w/ T Oothoudt & discussed Completion work to be finished this week.

8/31/88 J D Harden

117

Anticipate completion all WORK of development by saturday Sept10 or Monday Sept12. All work will be complete except for locks which have been ordered. They should be on during week of 9-16-88.

T. Oothardt departed site ≈ noon

JDH spent remainder of afternoon inspecting new wells + sites for completion.

1830 Depart Site

J D Harden 8/31/88

118

9-1-88 Thursday

Personnel
JDHarden D. Riemer
M. Roddy
J. Sherwin

Driller
J Anderson
B. Erickson
G. Oothardt
M. Razuski
Tim

Weather Cloudy, Cool, breezy

0700 Arrive office + meet w/ drillers to discuss day activity. M. Roddy will spudder w/ drillers & J. Sherwin on well development. JDH will continue checking wells and out sheet.

0830 Leave office & visit remaining drill locations to check completion progress.

J D Harden 9/1/88

119 9/1/88 Cont'd

1130 Lunch break

1230 Return from lunch will continue checking wells sites

1600 Catch Plane to ATL. after giving sign off sheet to P. Riemann. Will check well caps on drillers last day

[illegible] 9/1/88

120

9-7-88 Wednesday.

J.D Harden

S. Schultz

~~[illegible]~~

M. Roddy

K. Davis

J. Boelen

J. OBrien

1030 Arrived Site weather Clear. All personnel on Site. Will help Shawn Schultz set up & complete Sampling.

1300 Went to pick up equipment for Sampling crew. Battery to operate pump, Cables, & lunch for Sampling Crew.

1330 Returned to Site Lunch.

1400 Returned to work. Returned to office for supplies & continued helping Sampling crew

1700 Went to purchase Ultra [illegible]

1740 Returned to office too late to pick [illegible]

[illegible] 9/7/88

121 9/7/88 Cont'd

in Sample Coolers.

1800 Prepped bottles + matls for next day sampling. Made labels.

1930 departed Site. Picked R. McLeod.

9/8/88 122

Personnel

J. Harden R. McLeod
S. Schultz J. Beeler
P. Riensm M. Roddy
K. Davis J. O'Brien

Weather - Cool & Clear, Breezy

0700 Arrived at office. Sampling crew w/ continue w/ purged wells. P. Riensm & M. Roddy will continue purging wells. J. O'Brien & JDH will perform slug tests on select wells. Will perform slug in & slug out tests on all wells where tests are performed. Notes will be kept in slug test notebook.

9/8/88

48' 7"
9' 1½"
34' 5½"
20
19' 5½"

28' 1½"
9' 1½"
= 19 –

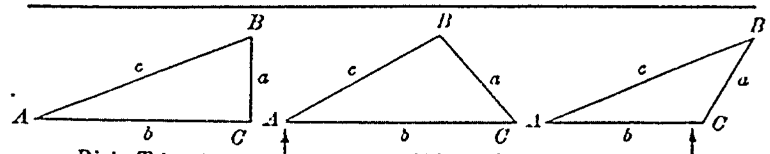
Table 5'2" a TOG
Total Depth 31' Bott of Casing
5,8' to top of table
36.8'
-14 SandPack
22.8' from top of table

6.3" table
35
41.3" fr table top

10' screen
27.5' casing
37.5' Casing + screen

41'3" from table top
-14'
27'3' Top of Sand Pack

TRIGONOMETRIC FORMULÆ



Right Triangle — Oblique Triangles

Solution of Right Triangles

For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

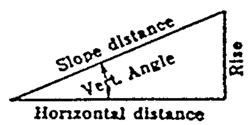
Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B,\ c = \sqrt{a^2+b^2} = a\sqrt{1+\frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B,\ b = \sqrt{(c+a)(c-a)} = c\sqrt{1-\frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90° - A,\ b = a\cot A,\ c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90° - A,\ a = b\tan A,\ c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90° - A,\ a = c\sin A,\ b = c\cos A$

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a\sin B}{\sin A},\ C = 180° - (A+B),\ c = \frac{a\sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b\sin A}{a},\ C = 180° - (A+B),\ c = \frac{a\sin C}{\sin A}$
a, b, C	A, B, c	$A+B = 180° - C,\ \tan\frac{1}{2}(A-B) = \frac{(a-b)\tan\frac{1}{2}(A+B)}{a+b},\ c = \frac{a\sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2},\ \sin\frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}},\ \sin\frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}},\ C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2},\ \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	$\text{area} = \frac{bc\sin A}{2}$
A, B, C, a	Area	$\text{area} = \frac{a^2\sin B\sin C}{2\sin A}$

412-30-5352

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft. Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14\times 14}{2\times 302.6} = 302.6 - 0.32 = 302.28$ ft.

MADE IN U. S. A.

Q.2.2 Notebook 2, Rig No. 1

This notebook contains notes of the drill rig geologist.

Entries were made by Peter Riemersma, Jo-Ann Sherwin and Mike Roddy. One hundred and seven pages were used; several pages in the back were used as scratch sheets. The first entry was 26 July 1988 and the last is 2 September 1988. The pages are signed by Peter E. Riemersma, Mike Roddy and Jo-Ann Sherwin.

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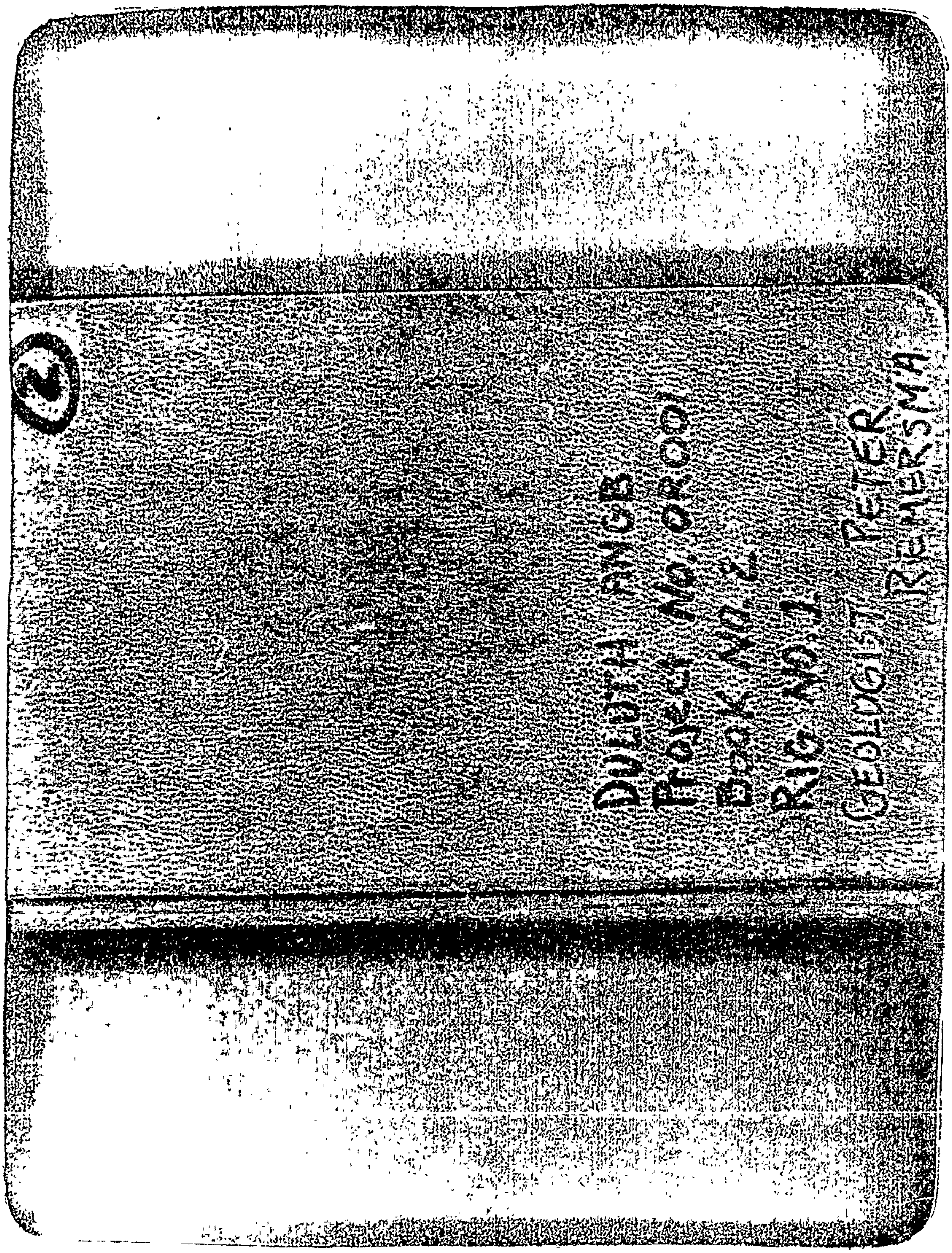
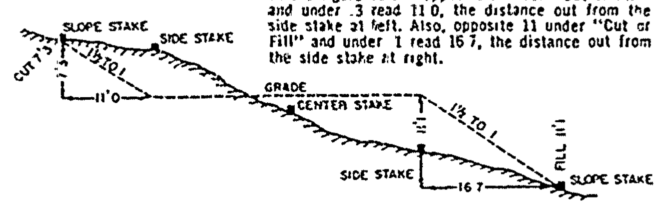

2
DULUTH ANGB
Project No. 0R001
Book No. 2
Rig No. 1
GEOLOGIST PETER
REMERSMA

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

KEUFFEL & ESSER CO.

For Curve Tables see end of book.

Return To, Robert S. McLeod
Engineering-Science
710 S. Illinois Ave.
Suite F-103
Oak Ridge, TN 37830
(615) 481-3920

K+E The paper in this book is made of 50% high grade rag stock with a WATER RESISTING surface sizing.

KEUFFEL & ESSER CO.

Sampling Equipment Utilized

Item	Eqpt.	Asset #	Serial NO.
1	HNU PI 101 FIELD PID	566791	

DATE 7-26-88

E.S. Personnel on Site

FTL John D. HARDEMAN

Geol: Peter Riemersma

Geol: Jo Ann Sherwin

Eng. Kim DAVIS

North Star Drilling

Tom Cothoudt owner

Bill Erickson HSO

John Anderson Driller

1400- Rig Decontamination, steam cleaning, soap wash with Liquinox

1535 Used Quic-Kut by Graco for wash for 5 minutes

Personnel Deconning
Mike Edwards Bill Erickson
Jeff Ausland
Dan Graves

1547 Working on getting soap to flow, try putting it up above valve, switch back to Liquinox

1600 run Liquinox through steam cleaner drain for decon area is backed up

1803 put diesel fuel in steam cleaner for heater pump runs on electricity.

1830 water problems → pressure loss

7-26-88 Peter E Riemersma

5

trying to switch hose at fire hydrant, may be high water usuage, time

1855 Leave the field, drill crew in process of leaving due to water loss

7-26-88 Peter Riemersma

6

7 Date 7-27-88

ES. Personnel
John Haceleman
Peter Riemersma
Kim DAVIS
Jo Ann Sierwin

7.30 arrive on site

PLAN Kim D and Jo Ann S will go measure water levels at site 2
John H and Peter R. will observe decon of equipment

7:56 Rig decontamination continues. Mike Edwards, Bill Erickson and John ~~Edstar~~ PER Anderson deconning. Mike E. says they started at 7:00 AM, Steam cleaner water temp 230

8:01 Tom Sturdivant and Dennis Forsberg arrive they examined Culligan water purification system

8:22 - 9:04 John H arrives at DeCon Rig, Peter R. goes to decon 4 pieces of tubing from Culligan Supply (water) Decontamination Procedure involves
1) Liquinox wash with brush
2) thorough rinse with potable water
3) thorough HPLC water wash and rinse

Methanol rinse was omitted due to concerns of ES (John H) and Dennis F. of reaction with plastic.
Decon complete / Peter E Riemersma

9:10 observe decontamination of rig

7-27-88 Peter E Riemersma

7-27-88 8

10:20 John H. comes to pre-inspect cleaning of rig.
11,22 We are turning soap off for Final rinse (Bill Erickson, Mike E and Peter R.)
11.45 Final Rig Decontamination Completed
Accepted by Peter Riemersma
total Steam clean hours for rig 11.25 hrs

12:00 - 2:00 LUNCH

2:00PM John A. steam cleaning North Star Flatbed
Peter R. and Bill E. work on deionized water set up

2:28PM Truck with barrels arrive

3:29PM Start to clean white schedule 40 PVC
Procedure Steam clean with Alquinox (outside)
(use snake for inside) Steam clean water (outside and inside)
Methanol rinse (out and in)
D.I. organic free rinse (out and in)

Start of cleaning of PVC postponed, need more diesel fuel for steam heater

4:11 Truck returns with diesel fuel, Mike continues cleaning truck with cold water

4.30 start cleaning white PVC (Procedure above)

4:45 want to attach snake for PVC internal wash

4:58 Tom S. + Dennis F. and John H. arrive
We notice a small cylinder leak? valve from Jack - John A take care of problem per suggestion

7-27-88 Peter E Riemersma

by Tom S. of HAZWRAP - put a bucket with an absorbent below the jack to hold leaking fluid.

5:34 Several areas on rig appear dirty when tower is raised. John A. is deconning it.

6:15 John H. and Peter R. leave site.

7-27-88 Peter E Riemersma

7-28-1988

ES Personnel on Site

Peter Riemersma
John Hardeman
Kim Davis
Jo Ann Sherwin

HAZWRAP Personnel

Tom Sturdivant
Dennis Forsberg

7:55 Peter R. arrives on site, delayed due to dead battery on van. Kim D and JoAnn S. work on water levels. John A. discusses rig fluid leaks with John H. Suggests that if rig is leaking this much without any pressure it might leak more under pressure. Tentative decision is reached to bring in another rig. Mike E. sprays off rig.

Well point PVC casing has been steam cleaned and rinsed and put all together under plastic by Mike E and Bill E.

8:47 John A. Starts decon procedure per work plan (steam clean w/ alconox, steam rinse, methanol and di-organic free water). Cleaning 16 drill pipe 3½ inch outer diameter, 5, 1 7/8 inch 20' (2, 10' pipes together)

9:28 Bill E and Mike E are breaking pipe (20 foot sections) in preparation for cleaning

7-28-88 Peter E Riemersma

7-28-88

10:10 AM Bill E is wrapping up in plastic total of 6 3½ inch drill pipes and 2 smaller pipes each tool is being wrapped individually in case of need. Decontamination complete Peter E Riemersma

John is working on 1 7/8 inch pipe we will use often in drilling.

10:40 John A and Mike E work on rig. Bill E. finish wrapping pipes described above.

11.20 Met Sgt Dennie. No message: meet with FAA at 12:30 - message for John H.

11:27 Break for Federal Express & lunch

1.35 PM Danny Graves replaced seals on controls and said he put seals on. Mike E steam cleaning rig. They said augers were not done yet

1:55 Tom S and John H. come to take a look at new seals and plugs.

3.28 Wrapping in plastic 10 1 7/8 drill pipe plus 4 other tools Decon Procedure as follows
1st Steam clean with Alquinox (outside)
2nd Steam clean water rinse (outside and inside.
3rd methanol rinse
4th DI Rinse
Drill pipe will be used with split spoon sampler Deconned same as above two split spoon samplers with attachments.

7-28-88 Peter E Riemersma

Decontamination of 10 1 7/8" drill pipes 2 split spoon samplers & misc. tools (6) complete per work plan.

Peter E Riemersma 7-28-88

3:39 11 10 6 5/8" I Diameter hollow stem augers
12 4 1/4" I Diameter hollow stem augers have come back from the sand blasters and are being unloaded

4:20 new bit for hollow stem auger is being put on. Hollow stems steam washed with soap

4:45 Jeff Ausland cleaning up sludge and putting in drum

5.41 Decontamination of 13 hollow stem augers decon per work plan.
Certification by Peter E Riemersma 7-28-88
Wrapped together in plastic and put in flatbed trailer

6.00 left Decon area and site

Peter E Riemersma 7-28-88

7-29-88

6.30 AM arrive at office on site, cleanup Van and prepare for day. Partly cloudy with very light sprinkles.
Jo Ann will go down to measure water levels

6.30-7.45 Loading van up with supplies

805 John A. washing white buggy rig

930 Went to drop Kim off to help Jo Ann
Dan Graves arrives with shire, final preparations for going to Site 2

1015 Show drillers Site 2 Fire training area number 2
They are in the process of moving their equipment over here. Told them about - Don Graves, Mike E, Jeff B. stopping and looking for airplanes when driving on the dirt road near the runway approach.

1106 Waiting for rest of drill equipment to come.
D. Graves is setting his rig up near center of FTA no. 2

1110 Augers and other drill pipe arrive

1155 Bill E goes to get water truck

Procedure for Mason jar samples
2-BH-1 SS-__, Footage
HNU Procedure
(HA) 1) take reading when cap of auger is taken off
(HB) 2) take reading of breathing space

1:11 PM Drillers prepare for drilling

7-29-88 Peter E Riemersma

7-29-88

1:20 Work on getting Sample 2-BH1 SS-1 0-2. requires two split spoons due to poor recovery. 2 jars sent - 1 liter and 4 oz

2:12 taking SS-2 at Site 2 BH-1 4 oz bottle SS-2 1 liter is from 2-6' actually
HNU reading at top of split spoon is 150 ppm

2:40 Took HNU reading in borehole - maximum of 7 ppm - 0 ppm in breathing zone

2:55 PM Poor recovery of 4-6' not enough sample to send to lab, do get HNU reading of split spoon tip of 175 ppm

3:49 Drillers back from getting 5' drill pipe

4:08 Took 4 oz sample SS-4 HNu reading at split spoon tip upon opening was 225 ppm

4:40 Collected SS5 samples to go to lab because of HNU reading of 175 ppm in split spoon

5:00 Leave Site 2 for day, storm approaching
. Kim P. and John H. go to Fed X

5:00-545 Peter R. decons 5 stainless steel buckets

7-29-88 Peter Riemersma

6:35 AM arrive at office, calibrate HNU according to page 5 of ASSET # 164716 Probe # 501288 Span setting manual 9.5. Clear

7:10 arrive at site 2 Jeff A. and Bill E. already at site

7.40 start drilling - pushing auger down BH1

ES Personel John H
Peter R
Kim D

North Star Mike E
Dan G.
Bill E
Jeff A.
John A.

7:52 45 ppm down hole at top of auger flight breathing zone less than 1 ppm

8:04 Hammer on rig breaks down

9:22 Hammer is ready and was welded ready to start pounding split spoon in

939 Took analytical sample at 10-12 SS-6 at water table split spoon headspace 5 ppm

10:14 Sample SS-7 taken, slight petroleum smell 5 ppm split spoon headspace,

10:45 SS-7, clay, no odor, pebbly, mason jar sample taken

7-30-88 Peter E Riemersma

11.22 pull out of hole at 16' due to auger refusal. ~~bust it fast~~ Probable boulder.

13:06 Back From Lunch (11:30-13:00)

Move rig to BH-2

13.28 Start hammering in SS-1 in BH2 0-2'

13:37 take sample SS-1 BH2 SSHead = 90 ppm (SSHead = split spoon headspace)

13:50 SS-2 sample described + put in mason jar

14:05 SS-3 sample taken in mason jar

14:23 SS-4 sample, high SS head reading, sending sample to the lab. Need to take another sample in same interval for lab samples.

15:00 SS-6 taken, sent to lab, estimated location of the water table

15.10 SS-7 taken, very moist to wet, at or below water table

15 30 SS-8 taken, very wet, porous sandy silt zone

Only 18" of split spoon hammered before refusal

15:50 SS-9 alt. wet and dry areas depending on proportion of sand and clay apparently

16.13 Attempt taking sample 18-20 but boulder in the way

7-30-88 Peter E Riemersma

16:36 Clean up site
17.20 Leave office

7-30-88 Peter E Riemersma

8-1-88 Weather cloudy, occassional sprinkles, possible heavy rain

6:00 AM Arrive at office, start packing and decon bucket
6.16 Calibration of HNU ASSET NO 164716 and 11.7 eV Asset NO. 501288 to 94.7 ppm isobutyl standard
615-650 Decon 5 stainless steel buckets Procedure
ALQUINOX wash w/ brush
potable water rinse
methanol
Di-ionized 8-1-88 Peter E Riemersma

7.16 arrived at Site 2, Schraam Rig (Graves)
743 SS-10 only 4" recovered before refusal
751 Auger refusal, bedrock at 2.1, pulling augers out of borehole
8.31 Start Setup at Well point 6 name of well
DANG2-WP6-shallow Schraam Rig (Graves)
9.41 Dan G and Jeff Aus arrive. Start work WP-6
Drill Crew Mike E.
Jeff A
Dan C.
ES Peter R.
Kim D.
9:49 ~~S7~~ SS-1 taken
10:17 SS-2 taken
10:40 No split spoon sample taken at 10-12

8-1-88 Peter E Riemersma

8-1-88

	due to auger refusal, try to auger past obstacle
11.00-12.00	Lunch
12:24	Move WP-6 location 7' west to a new location to attempt to drill below 10' obstruction at earlier borehole.
12.52	Down to 10' - takes split spoon 10-12 at new location
13:03	SS 3 WP 6-2 (second, adjacent hole)
13:47	No split spoon taken at 15-17 due to rocks and probable refusal, will try to auger past obstruction then split spoon
14:15	Still trying to auger past obstruction
1440	stop at 17', wait for John H to come back Scattered thunder nearby. Wait for additional grouting equipment to come
1725	Grouting material arrives, we move to BH-1 + BH-2 to grout the holes up, work on getting fittings put on
Grout CALC	2 lbs bent 100 lbs cement
Paul	6 gallons of water per 100 lbs
	8" borehole 2 gallons to the foot
ACTUAL Mixture	
Cr...	~~||||~~ Lehigh Portland Cement Type 1A 94 lbs net
	add ~ 10 lbs bentonite 1/5 bag
	pump ~~fan~~ belt broke

8-1-88 Peter Kiemenema

8-1-88

19:11 Leave grout area Site 2

8-1-88 Peter E Kiemenema

8-2-88

6:10	Arrive at office. Very cloudy and raining
6:52	Calibrated HNU ASSET NO. 164716 and probe.
	501288 to 94.3% isobutylene mixture
	Span set at 8
7:40	Jeff A and Mike E go to fill water truck w/
	Peter R., Bob McLeod and John H look for
	MW-3. Kim D and Jo Ann S go to map out
	FTH NO. 2 wells
8:56	Help Jo Ann S and Kim D. measure in wells
9:19	WP-6 Construction
	1¼" Cresline PVC sch 40 PVC 1120
	to glue fittings use Oatley medium clear
	cement PVC
	12½ feet casing
	5' screen .10 size screen
9:34	Prepare to put casing 10
	in
10:35	Move to new location to drill a straight hole
	for WP-6 using white "buggy" drill rig. Begin
	drilling. Encountered rocks at new hole. Abend. hole
11:30-12:30	Lunch
13:00	AT WP-6 site, Rotasonic drill rig on site, will soon
	begin to drill when Canadian arrives.
13:14	Go to site 4 to help Kim and Jo Ann

8-2-88 Peter Rieneman

8-2-88

13:14-14:22	IN office.
14:22	AT site of WP-6, crew Jeff A's. Mike E,
	John H, Bill E. are working on cement
	pump, Canadian Rotasonic rep has still not arrived.
15:01	BH-7, finishing up grouting of
	borehole
16:26	Continuing to wait upon Canadian driller to help
	with Rotasonic rig
17:01	Leave site
17:10	Leave office for day

8-2-88 Peter E Rieneman

8-3-8

6:30 Arrive at office, weather is cool, very foggy.
ES persons Ben McLeod
Peter Riemenschneider
Kuniwaskiz
Jo Ann Thurwin
John Hardeman

7:20 Arrive at WP-6 location, start on 4th WP-6 hole
with Rotasonic Drillers Paul K
Jeff A.
John A.
Bill E.

HNU Calibration Asset No. 500771 Probe 500018
calibrated to 94.7 % isobutylene per instructions
SPAN setting 22

7:57 Real TUFF Teflon Paste Thread Sealant is manufactured by Heraulis contains fine-grained Teflon particles stock No. 15-630
HNu reading of Teflon paste < 1 ppm Peter Riemenschneider
Jim Hnatishin - Canadian Midwest Driller

8-8:53 need air pump, so John A. went to look for one
9:15-10:00 Went to Knox Hardware and bought 4 yellow hardhats

10:13 Tom Sturdivant, Larry Jansen from HAZWRAP onsite WP-6. Enrique (MPCA) also on site.
Drillers have drilled down to 25', will put well screen 10-15 and sand pack beneath it
3'10 1/2 base of well to split table.

8-3-8 Peter E Riemenschneider

8-3-88

rotation 96 rpm
Rotasonic - max 9000 rev per minute

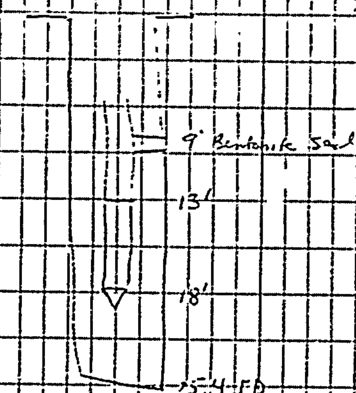
6'6" ground to split table

11:30-1:00 Go back to office, drop off laundry, Eat Lunch

1:00-2:00 John talks to Larry J., Tom S.,

WP-6 Well Construction — Sand used Granusil by Unimin corp Grade 20/40 02018

25.4 TD



complete sand pack to 9'

1445 Continue to construct well point

1525 prepare to put 1-2' bentonite seal in WP-6

1705 Look for way to get to WP- in swamp at site 2
Wait to grout WP-6 tomorrow

1730 Leave site to go home

8-3-88 Peter E Riemenschneider

CCE G

6.15 Arrive at office, weather is rainy with cloudy skies, appears it's going to last much of the day.
Calibrate HNu HSS# NO. 500791 and 11.7 ev Probe 500018 per instruction manual SPAN setting 32

7:10 AT SITE 2 MW12 in ETA NO. 2. John A. and MIKE E. Go to get raingear and sheeting Peter R gets van stuck and pulled out by JEFF D's truck

7:30–1030 : Decon & screens
20' s steel pipe casing
per workplan procedure
filled up sprayers

10.50 BacKhoe moves off trailer

11:02 START DIGGING with Backhoe, Drillers work on fixing drill rig.

12.42 Stop digging with backhoe

1300–14:25 Lunch

14.57 MW-12 took duplicate of PANG2 - MW12 SS1, 0-2' named SS4 0-2' (duplicate)

15:08 SS2 taken 2-5'

1540 SS3 Analytical Sample Send sample to the lab

1551 SS5 15-20' take 5 grain size and send samples to the lab

1621 23' TD for MW 12 PANG2
will abandon hole as adjacent well is at similar depth

8-4-88 Peter E Riemersma

16.21–16.40 Work on getting 5 grain size samples

16:23 took 4 photos of cores

17:16 Sent 9 samples to lab 1 duplicate of SS1 (labeled SS4)

17:50 Arrive at office to drop off equipment

18.00 leave office

8-4-88

8-5-88

6.00 AM Leave Hotel, rainy, windy
6.30 AM
7.30 Set up on site 2 MW-13 adjacent to GW2A — GW2A water level 8.4 to water, 9.4' total depth;
7:49 took sample for lab at MW-13 Site 2 0-2' no HNU reading
HNU calibration in K. Davis field book
8:17 collected SS 2: 5-15'
8.31 SS-3 taken at 8-10' for lab estimated water table from adjacent well
8:47 SS4 sample taken 14-15' sent to lab coarse-grained pebbly sand, loose, moist
8.53 Grout hole up since adjacent well screened of at about the same interval
Top of bedrock was fractured per Driller from drilling noise
9.27 Drillers working on grouting up borehole MW-13
10:03 Go to Decon area of Base ~~to see w/~~ check about where cement is and document decon
10.46 Decon of Rotasonic pipe per Work Plan
Peter E Riemersma 8-5-88
11-12.00 Grout up MW-13, stop by Civil Eng to try to pick

8-5-88 Peter E Riemersma

8-5-88

up drilling permission forms for Site 8, not there.
Talked to Bill Hayden on the phone
1.38 Start drilling at MW-18 Site 8
well is adjacent to MW GW8-C
1348 SS1 sent to lab, collected sample
water table in adjacent well is 8' below land surface and TD = 16' according to our water level indicator measurements
1432 SS2 taken, sent to lab, water bearing gravel and silt zone, Wilson jar sample taken
SS3 is 14-15'
1533 Start drilling MW20 at Site 8
adjacent well water table at 6.5' (GW8-B)
total depth 19'
1545 SS1 taken 0-2 - clay
1605 SS2 taken 6-8' for Lab
SS4 taken for lab base of borehole
Grain size analysis below water table
GSA1 6-7
GSA2 7-8
GSA3 8-9.5'
GSA4 9.5-10.3
GSA5 10.5-11.5

8-5-88 Peter E Riemersma

29

8-5-88

~~170~~

1650-1800 Sample preparation and Fed X-ing

6.30 Back at Hotel

8-5-88 Peter E Riemersma

8-6-88

30

6.10 Arrive at office, prepare for work - decon buckets and bowls. Weather: sunny, clear blue skies

7:30 John H and Jim (Canadian) decontaminate drill rods

Personnel

ES Kim D., Peter R., Jo Ann S.

NorthStar John Anderson

Midwest Jim H.

7.51 Start drilling WP-10S, to 8

0-5 and 5-10 done by 8:08

8:28 10-15' sample taken Very wet organic rich zone 10-14 may be part of past soil zone

9.11 Drilling from 22.5 down

9:30 got sample from 22.5 - 32

Going through quite a few dry slightly moist clay and silt layers with probably poor sand production

Kim D. is taking photos of core samples

10:00 Take a break for John H and Jim

10:18 End of break

10:30 Sampled 32-35

11:30 break for Lunch

12.30 waiting for Drillers to come back so we can begin WP 10 D construction

8-6-88 Peter E. Riemersma

8-6-88

~~For~~ Well Point 10 D Construction

TD of borehole 47.5 btm of casing at 40'

Bedrock at 45

PLAN – 2' of sand pack below bottom of well point

3' of sand pack above screen interval

ground to table = 6.5

btm of hole is 45.5

43.5 + 6.5 50.2C

Shoot for .5

btm of screen 43.9'

top of screen 38.8.5

btm sand pack in to 43'

4.8' out of 5 gallon pail of sand fills

69.2 – 64.4
-20 -20
44.4
6.5
37.9

We want to — we want to sand pack up to 35.9

(35+20+6.5) = 61.5

60.9
6.5
~~20~~
.4

btm of sand pack below well point 43

well point 43 – 38

sand above well point to 34.4

then pull casing measured sand at 35.9

40.9
-6.5
34.4

need to put 1 more foot of sand in

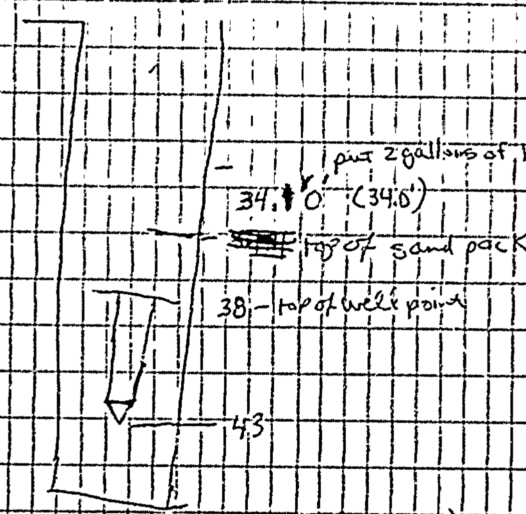
Measured sand above ~~casing~~ screen at 34'

62.4
12.1
42.4
-6.5
3-5.9
3'1
-41.4
6.5
35.9
34

60.5
-20
40.5
6.5
34.0

Peter E Ramewarna 8-6-88

WP 10 (deep) sketch with actual dimensions



13:30 JoAnn and Kim TD 45.5 (measured) drive from Errand

2:27 (14:27) Start to put bentonite seal in

14:40 Finish putting bentonite seal in

We are going to start MW10 (shallow) after the casing is pulled up from MW 10 D

14:57 START drilling MW10 Shallow approx 6' east of MW10 Deep

15:13 SS2 recovered

15:30 SS3 recovered

15:51 Prepare for Well Point 10 Shallow

construction

PLAN TD ~20'

want well point to bracket gravel lense which is approx. 13-14' so put well point screen 12-17, probably missing 15-16.5 or in next core so screen that interval also

cased to 20'
holes.15

44
203
24.0
6.5
17.5

Pull up casing 3' feet after putting approx 3' of sand in it

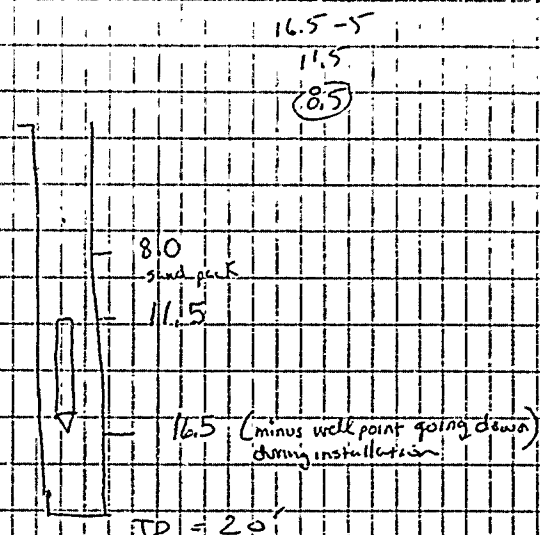
put ~~in at~~ sand until 11' → pull out 5' of casing

45.5 34.5
25.5 14.5
6.5 6.5
19 8
1.5
17.5 16.5
44.5 30.1
18.9
6.5 16
12.5 6.5
9.5
13.1
6.5
6.6

put sand pack in to 8' with casing lifted to 5'

8-6-88 Peter E Rieman

WP ~~MW~~ 10 Shallow Sketch



16:44 finished putting sand pack in to 8' below ground surface
17:01 finish bentonite seal ~2 gallons
17:30 leave office
18:00 Arrive at hotel

8-6-88 Peter E Rieman

8-8-88

6.15 Arrive at office, weather partly cloudy but sunny, some wind, decon 2 buckets

Kim D. calibrates HNu

7.05 Prepare to move equipment to MW 14 deep, furthest to the north

7.53 Setting up water truck

Personnel on Site

ES Peter Riemersma

JoAnn Sherwin

Kim Davis

NorthStar John Anderson

Jeff Ausland

8:25 SS1 taken 0-1' sent to lab

8.32 SS2 taken wet at

8:58 SS3 sent to lab from 10-12 gravel zone

call duplicate

9.11-9.59 Break, get diesel fuel for rig

10.19 Poor recovery on sample SS4 15-25

once core was very wet and went through

drill but upon removal

10.52 Drilling SS6

11.25 SS7 taken

Rock fragments are often granitic and gabbro

12:07 SS8 taken Lab sample from 39-39½

8-8-88 Peter E Riemersma

8-8-88

Going to set casing at 40'

12.40 - 2:00 Lunch and errand break

2:00 Prepare stainless steel casing 2" Johnson Schedule 5 Type 304

sand pack TD to 40'

casing down to 40'

3:30 3:45 rig battery needs recharging

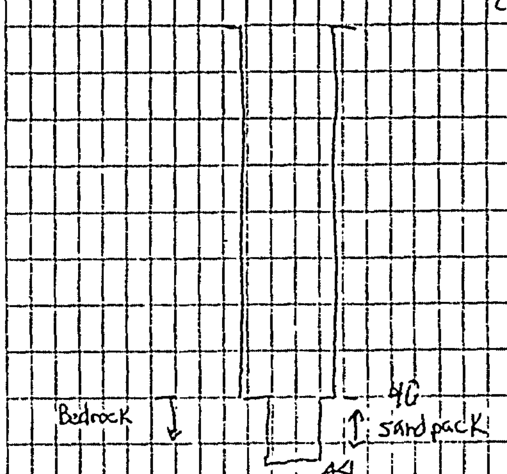
4:00 rig needs to be recharged, leave site for the day

at office, organize stuff, call Oldham chemical

4.54 Leave office

MW 14

continued on page 38



8-8-88 Peter E Riemersma

37: 8-9-88

6.25

Arrive at site, Partly cloudy, sunny

Calibrate HNU ASSET NO. 164716

Probe NO. 501288

Span Setting 90

ES at MW14 Site

Peter Riemersma

John Hardemann

North Star

Bill E

John A.

Jeff A.

7:00-7:20 Determine we need centralizers and 3/4" PVC tremie pipe for MW14

7:30 MW10 D depth to top of bentonite ~~33.5~~ -20 (13.5)

MW10 S depth to top of bentonite ~~8'~~

Came back with tremie pipe and reached bentonite at MW10S and max. 25' in MW10D since thats all the tremie we have

7:30-9:00 Drillers go to get 3/4" tremie, prepare equipment for grouting MW 14

9.20 John H. goes to Knox to buy PVC couplings

9.28-9.50 Put Methanol Lot no. 882613 in stainless steel sprayer, Decon 50' of 3/4" tremie pipe

9.50-11.19 Put sand pack in up to 26' by tremie pipe

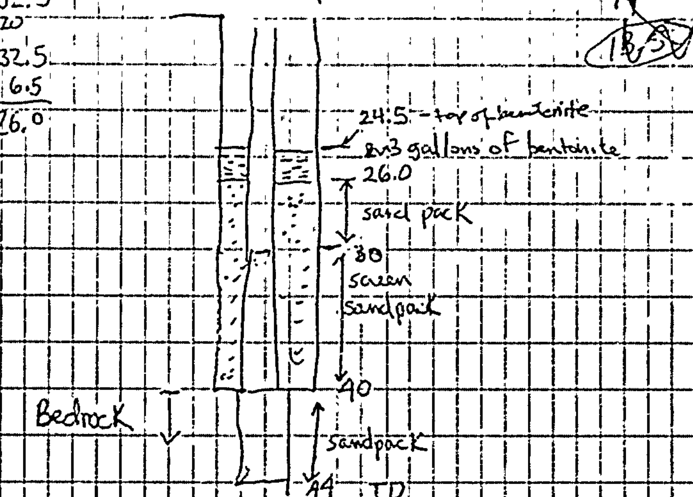
8-9-88 Peter E Riemersma

8-9-88 38.

53	51.7	54.1	57.2	54.6	
33	31.7	34.1	20	34.6	
6.5	6.5	6 MW 14	37.2	6.5	
26.5	25.4	27.8"	6.5	28.1	
			30.7	~~17.33~~	
				19	
				18.5	

52.5
-20
32.5
6.5
26.0

MW14



11:43 Put 3 gallons of bentonite plus some bentonite pellets at the top of the bentonite seal

12:17 Trouble with cement mixer engine

Now on site Tom C, Dan Graves from North Star

12.45 Start mixing cement,

Lunch ~~12:45~~ 13:00 - 13:30

13:30 When I came back protective casing had been installed while John H. was there.

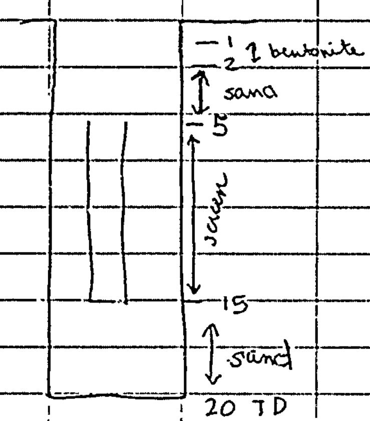
8-9-88 Peter E Riemersma

39

8-9-88

13:30 - 14:30 Decontamination of pipe.
14 55 Start drilling MW 15 (Shallow)
1519 Water table ~ 6' where sample first becomes wet good wet sand and gravel gone at 6-10'
15.56 Complete drilling of borehole, T.D at 20'
Will set btm of screen at 15'
17½' of stainless pipe

MW 15 Construction



18:04 Complete construction of MW 15 as shown by sketch above
18:12 Leave office

8-9-88 Peter E Riemersma

40

8-9-88

initial 45.8 − 26.5 − 6.5 = 19.3 | 41.7 − .6 − 6.5 | 42.1 − .2 = 15.1 | 5.2 + 17.5 = 22.7 | 22.7

15+10
15+17.5 39.4
19.4 to sm
− 6.5
12.9

Total 15

22.7'

17.5
6.5
8' 3" top of pipe 5.2
19.2 = total pipe stickup
15+6.5+

22.7
8.25
14.45

2

17.5
5.15
22.65
− 7.65
15.00

7.65 above

7.65
5.2
2.45 above ground

6.5
.7
7.2

14

9.2
6.5
2.7

1' below table
6.5
6.5 down
5

3
6.5
1
6.5
4.5

Notes above from MW 15 calculations

8-9-88 Peter E Riemersma

8-9-88

Summary

MW 14 Construction   Total depth 44', bedrock at 40'

10' screen from 30-40

total casing 31'3" (14" short)

MW 15 Drilling

20' Total depth drilled

MW 15 Construction

screen from 5-15

sand pack to 2'

total casing 7½'

8-9-88 Peter E Kiernan

8-10-88

6.30 AM Arrive at office, Sunny, blue skies, slight breeze.

GW8-A, adjacent to MW 19

~~approx~~ depth to water table 6.5

total depth ~ 13.0'

Auger Refusal from boring log at 13'

7.52 John back with drill rods

8.01 Start Drilling MW 19

8.10 Sample SS1 0-5 (sampled at 0-2') to Laboratory

8.25 Sample SS2 6.5-7.5 to Laboratory

8.37 Sample SS3 9-10' to Laboratory

8.48 Took picture of 0-13.5' Photo

Boring terminated at 13.5' and abandoned since adjacent well ~~GW~~ GW8-A is TD at 13'

9.21 Setting up at MW 16 Site 8

9.24 Start Drilling MW 16 Site 8

9.34 Water table very shallow at ~~2'~~ 6.5' in wet ~~peat~~ clay   8-10-88 PER

9.34 SS-1 taken at 0-1, dry peat, Laboratory sample

9.44 SS-2 taken at 4-5, ~~wet~~ moist peat, Laboratory sample

Decide to take sample SS-2 instead at

10.04 clay interval 6.5-7.5 to send to laboratory as this interval more appropriately represents top of the water table (done at 10.04)

8-10-88 Peter E Kiernan

26.8 - 28'10" boulder
28'10 - 29'11" sand
29'11 - 33'8" ROCK

casing at 30.2"

8-10-88

1101 Took SS6 sample of coarse sand and core of boulder

1124 SS 6 taken for Laboratory 29-30', gravel ~~bould~~ between bedrock and boulder

Summary from driller

~~26'8" - 28'10"~~

26.66 - 28.85 boulder

28.85 - 29.95 sand

29.8 - 33.66 bedrock

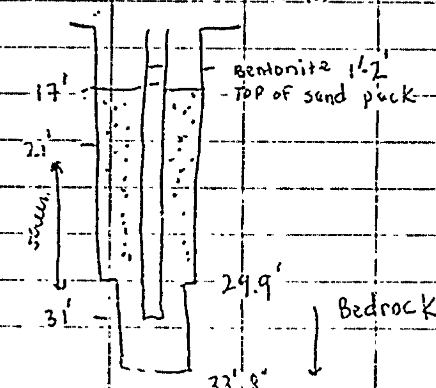
11.40-12:40 Lunch

MW 16	GSA 1	14-15	sand
	GSA 2	16-17	clay, little silt
	GSA 3	20-21	Silt
	GSA 4	24-25	Sand and silt
	GSA 5	29-30'	gravel

13.11 Finished collecting grain size samples

Peter R Start to assist John H. in construction of MW16

MW16



8-10-88 44

1439 Finished putting bentonite in, start mixing concrete

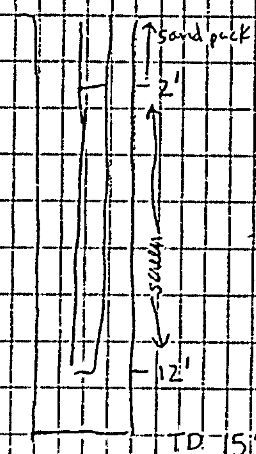
15:02 Finish putting grout into MW16 from 16' → Still need to put protective casing in

16:00 Start drilling MW17

16:38 Finish drilling MW17

MW17 Construction

Total length of screen 10'
Casing length



17.57 Have finished putting sand pack up to land surface

18:21 leave office

8-10-88 Peter E Riemersma

8-10-88

Summary

SITE 8 MW19 TD @ 13' at bedrock adjacent to GWB-A
~~abandoned~~ since adjacent well was to bedrock
Total Depth 13'

MW 16 Deep
hit bedrock at 29' 11"
Total depth 33' 8"
screen from 21'-31'
total casing ~~13½~~ 23½
sand pack to 17'

MW 17 shallow
Total Depth @ 15'
Screen from 2'-12'
Sand pack to land surface
total casing ~~5½'~~ 4½

8-10-88 Peter E Riemersma

77 (5.2 / 75.2') 72 / 52

8-11-88

51-51½ soft rock
51½-53½ rock

Weather, clear blue sky, warm, breezy

6.40 Arrive at office, decon material, load the van.

7-8:23 Work on preparing and reviewing driller sheets ~~Kim~~, Mike R, and Jo Ann S are going to backhoe up at Site 2.

9.19 Start Drilling ~~MW~~ WP 9D

10.07 Finish describing 11-18' Kim D. assisting in mason jar collection and photography Drillers: John A. and Bill E.

11.10 Kim took picture of core picture 20 in her book, 36-38' picture of poorly sorted hypercol fill

11.43 Finish describing 41-46'

12.08 Went through 2' of gabbro boulder before and 2½ feet of coarse sand and gravel. Finish Drilling at 1.05

12.~~35~~ 51 Quick break for lunch (12:51-1:36)

1.36 Bottle at well 9D final TD 54'
want screen at 45-50 start construction
total incl. casing sand up to ~~39~~ 40' to cover sand
Bone at 41-41½'.

65' total
9'
58' in hole
5'2"
50' 10"

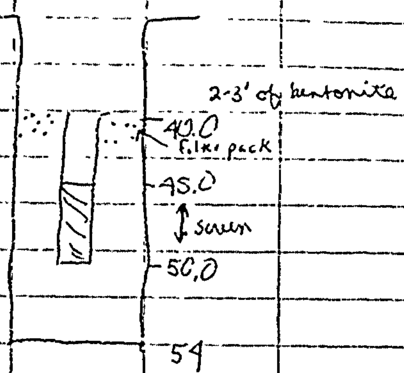
57'.2' want 52.5 (57.2)
-55.2 / 2.0'
4.7'

45' 2" to the top

16.5
5
41

40' of casing 60 gallons of grout 8-11-88

WP 9 D



3.39 ~~Put~~ Have ~50 gallons of grout in, will put more. John H. left at 3:00, back at 3.44. We're encountering difficulties with cement blobs plugging up the pump → drillers suggest installing a screen at the base of the fifty gallon mixing drum

3.50 John H. leaves to call time in.

1½ gallon of grout per foot for 6 inch hole

4.47 Leave site to go to office

5.13 PM Start putting remainder of grout in WP 9 D

6.11 Have moved to WP 9 S, which is approx 8' north of WP 9 D

6.15 Start drilling ~~MW~~ WP 9S

8-11-88 Peter E Riemersma

8-11-88

Construction of WP 9S

7:04 PM. Finish drilling ~~MW~~ WP 9S, TD@ 21'
well screen 10-15
Sand pack TD to 5'
bentonite seal 3½-5

7:53 Leave office

Summary for the Day

	~~M~~ WP 9D	WP 9S	TOTAL
Total Depth	54'	21'	75'
Casing Ft	~~49~~ 45	10'	55'
Screen Ft	5'	5'	10'
Base of Screen	50'	15'	
Stick up	2½	2½	5
Sand pack	40-54	21-5'	30'
bentonite seal	2-3'	1½-2'	3½-5
Grout	38'	—	

8-11-88 Peter E Riemersma

7:30 – Arrive at office, Weather is rainy,
9.30 drillers arrive to decon rig as site 8 is finished and we are preparing to move to site 2. Kim D. is overseeing decon. Peter R. went to check out barbers shops.
9.30 Weather is clearing up abit, blue sky
9.30–11:00 Prepare Drilling summary for John Hardeman summarizing depth of wells, amt of casing etc. Go to Supply at BNGB and picked up packages.
11–1.20 Work on organizing well logs, eat lunch,
2.30 Arrive at Site MW-38
Go to get core holder and drill pipe at decon area
3.13 Start drilling MW-38
3:20
3.30 PM Took SS1 0–1½' clay
3.49 hit something hard at 13.5
ES Personnel
John H.
Mike Roddy
Kim D.
Peter R.

8-12-88 Peter E Riemersma

North Star Drilling
Bill E.
John A.
4.10 PM Working on drilling past possible boulder from 17' down, already drilled past boulder from 13.5' to 16'
4.56 Left borehole, boulder or bedrock from 16.5 – 25', no water saturated zones recorded, may be screened off by boulder
5.20 Left office for the day.

8-12-88 Peter E Riemersma

8-13-88

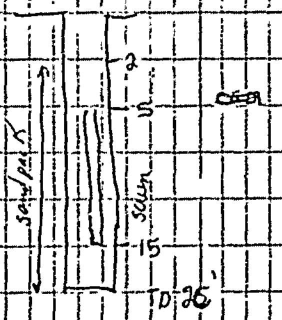
6.25 AM Arrive at office. Calibrate HNU Asset No. 164716 11.7 Probe 501288 Span setting 12
6.50 Kim D., John H, and Mike R. arrive at office
7.16 Arrive at site MW 38, Drillers have not arrived yet
7.42 Start Drilling 10' NE of previous borehole
7.55 Stop because of lightning
8.29 Resume drilling
9.10 SS1 0-2'
9.10 SS2 9-10½'
9.40 SS4 17-19'
Set screen middle at 10 - 5-15'
9.50 Drillers go to well screen and casing: Done with drilling MW 38
12.00 leave site due to continued rain and lightening
12:00-13:10 Stay in office, to unload van, leave for the day

8-13-88 Peter E Riemersma

8-15-88

6.30 AM Arrive at office, pack up van. Calibrate HNU ASSET NO. 500791 Probe NO. 500018
7.25 AM Arrive at MW 38, driller raise tower
8.30 Waiting to get centralizers for well

MW 38



ES Personell
Kim D, John H, Mike R, Peter R.
North Star John B, Bill E, Jeff A.

10.19 As casing was pulled out, well rose 1 foot probably because centralyzers (2) were too tight in the hole. We pumped water down the ~~well~~ outer casing and as it came out ~~the screen~~ of the hole - water it floated the sand out, enabling us to pull the well casing out of the hole, checking the condition of the screen and otatolizer. The

8-15-88 Peter E Riemersma

screen and stortaiyer were Fine and we are re-sand packing it.

11.00 Finished MW-38 ; TD = 20', screen 5-15
sand pack to 2'

12.18 Start drilling MW 37

12.55 SS1, Laboratory sample 0-1', clay, some silt

1328 SS2 Laboratory 5-6'

1326 SS3 Laboratory 16-17' sand,

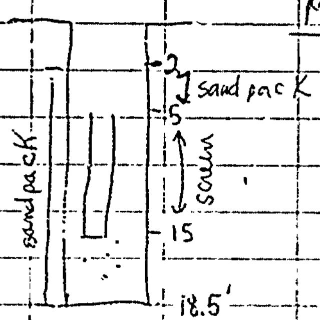
13.22 SS4 Laboratory 17.5 - 18.0

13.35 Finish drilling MW 37

14.13 Waiting for welder to weld cap on top of casing before installation

outer casing down to 18.5

MW 37



1530 Finish installing MW 37

1517 Start drilling MW39

1624 SS1 Laboratory sample 0-1'

8-15-88 Peter E Riemersma

Estimate water table at approx. 5', other wells nearby measure water at 6-7', first ~~moist~~ wet sample at 5-6'

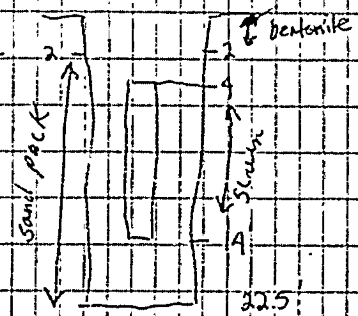
16.42 SS2 Laboratory 5-6'

17:05 SS3 Laboratory 21-22'

17.15 Kim leaves to bring samples to Fed Express

18:49 Complete construction of MW 39

MW39



19.18 Left site after decon centralizers

Summary

	MW 38 20'	MW 37 18.5'	MW39 22.5'	
total depth				- Construction MW38 / Drill + Construct MW 37 / Drill + Construct MW 39
Casing Fe	7½'	7½'	6.5	
Screen	10'	10'	10	
Base of screen	15	15'	14'	
Stickup	2.5	2.5	2.5	
Sand pack	2-20	2-18.5	2-22.5	
bentonite seal		0-2	0-2	
Grout				

8-15-88 Peter E Riemersma

55 8-16-88 175 27

- Clear blue sky.

6.30AM Arrive at office, Calibrate

HNU Asset No 500791, Probe NO. 500018

SPAN 8.6

7-8.15 Driller clean drill pipe per work plan

Prepare and load van for day

check Civil Eng for any packages that have arrived.

9.30 Start drilling MW 40

940 SS1 Laboratory 0-1' clay

> 1030 Finish drilling MW40

1045 SS2 Laboratory 7-8' clay w.t. estimate

10.53 SS3 Laboratory 15.5-16.5

MW 40 TD @ 17

Plan to screen 2-12'

1053-1130 wait for welder, lighting in the distance

11.30-11.58 Lunch

1239 Finish construction of MW 40

1402 Start drilling WP 7D

Location is in swampy region southwest of firing range

15.06 Have drilled to 25'

15.55 Finish drilling WP 7D Going to screen from 21-26' TD ~~@~~ at 29'

1624 Begin construction of WP 7D

17.14 Have to take out screen and casing since the well came up when some outer casing was removed

8-16-88 Peter E Riemersma

KR 8-16-88

8-16-88 mw 56

MW 40 Construction

27+2½'

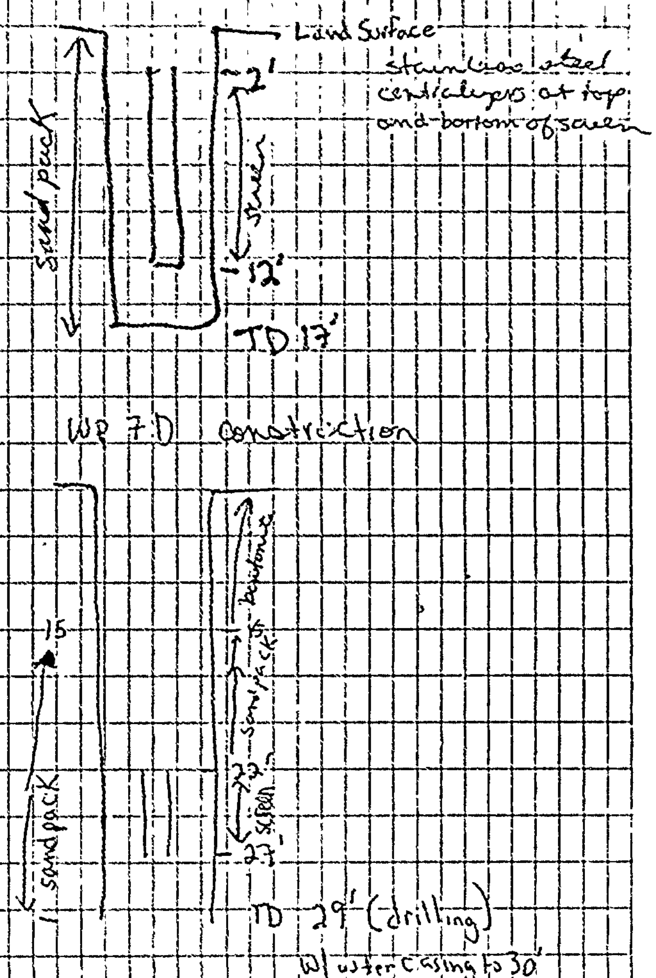
outer casing to ~~27'~~ 30'

G 15-15½

GW 13-14½

27

37 3½



8-16-88 Peter E Riemersma

57 8-16-88

1900 Leave site of WP 7D for the day

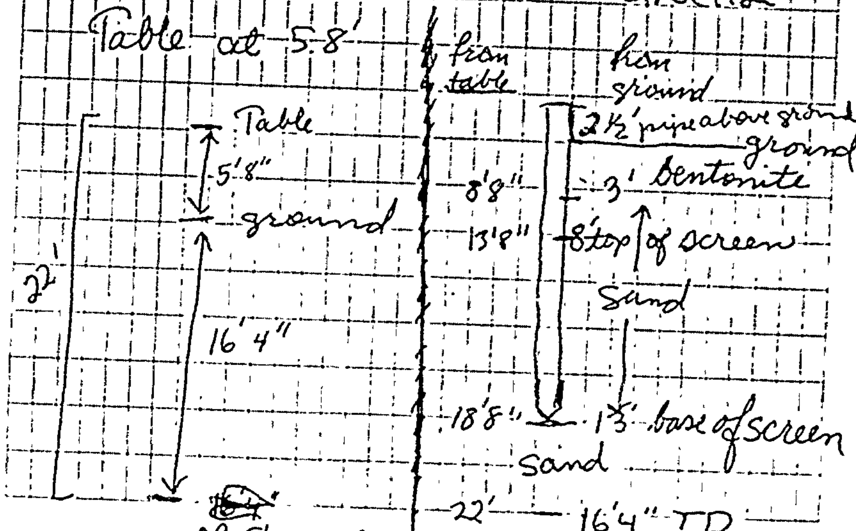
Summary

total depth
casing ft
screen
base of screen
Stickup
sandpack
bentonite
grout

8-17-88 Wes 58

6.30 Arrive at office, Foggy, rainy day, severe thundershower warnings until 11 AM
North Star Personnel

7:45 Calibrate HNU
HNU Asset No 500791, Probe No 500018
Span 18
8/17 JS 7 50 Start Drilling Well Point 75 (WP 7)
8:25 Weather cloudy & cool wind 4-10 mph
ES personnel Mike Rodd, Jo Ann S
John H
North Star John Anderson, Mike & Tom O
0900 Drilling Complete TD 15'
will start well construction
Table at 5.8'



JS 8/17

Jo Ann Sherwin 8/17/88

59 8/17/88 cont.

completed well at 9:40

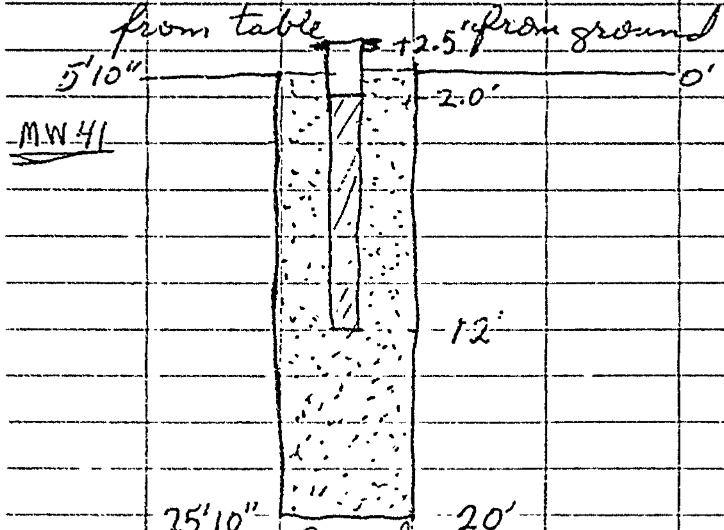
10:40 start setup at site 2MW41
11:05 start drilling

Duplicates taken, Sample Station ID is 2MP41

TD at 12:10p. 20.0'

Water Table 5'-7'

Start constructing monitoring well at 12:40p



Jo-Ann Sherwin 8/17/88

8/17/88 60

In pulling up the casing, the well point came up 3'. Proceded to flush hole to 15' after pu'ing the well and the casing. After flushing to 15' added sand to 11' and started to reconstruct well

2:40 well constructed, pulled casing, well popped up again. Washed out & reset well.
3:05 finished
3:10 Pulling off site

Move to 2WP8
4:05 Started Drilling

Water table at 13'

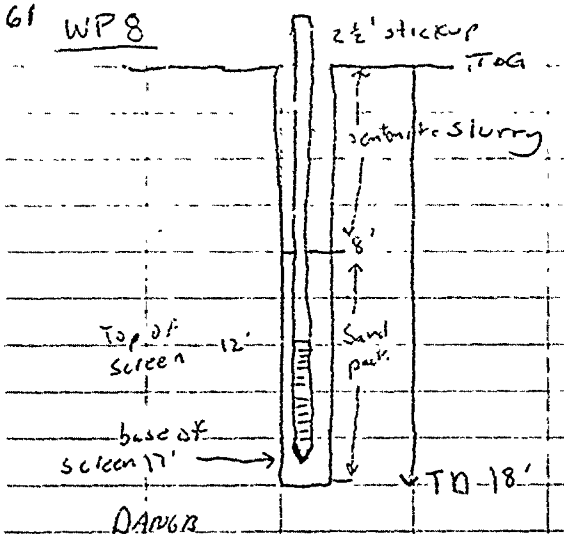
17:27 TD at 18'

17:35 Start construction of ~~monitoring~~ MR 8/17 well point

Mike Roddy 8/17/88

WP8

8/17/88



DANGR
leave ↓ 2 WP 8 at 18:15

Mike Roddy 8/17/88

8/18/88

6.40 Arrive at office, work on expenses
decon equipment, load up van

Weather: blue skies, some clouds
strong winds ~~flowing~~ southerly

ES Personnel

Kim D. who is leaving for home at 4.00
Mike Roddy } going to work on site
JoAnn Sherwin } 3 shallow soil samples
Peter Riemersma } going to work on
John Hardeman } background monitoring well

Drillers
John Anderson
Tim O.
Mike

PER ~~6.40~~ 8.48 We are awaiting clearance to background well site

10.11 Start drilling MW42

10.17 SS-1 Laboratory 0-1 clay MW42A background

10.30 AT 11' we recover white material interpreted to be concrete, we stop and ask base personnel what it might be

Peter E Riemersma 8/18/88

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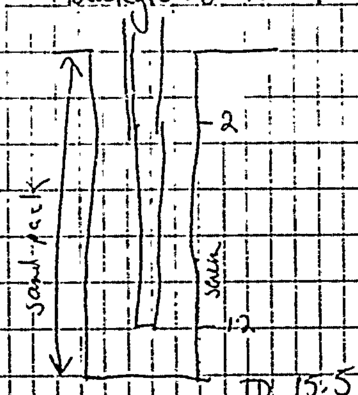
8-18-88

11.07	Move ~20' South to new location, ensure earlier borehole MW42A
11:14	Hit concrete at 3-5', going to move again
11:43	Start drilling 25' south of previous move at 11:07
11.50	SS-1 Laboratory 0-1', to replace SS-1 from previous rehole attempt at 10:17
12.24	Abandon well at approx 10', cored 2.5' of granite boulder, this was the third drilling attempt
12.50	Start drilling 4th attempt on MW42 - down the road along the side with a pond nearby
13:15	SS1, Laboratory, 0-1', MW42, replaces earlier sample taken at 11:50 whose borehole was abandoned
1319	SS2, Laboratory, 7-8' MW42'
1325	SS3, Laboratory 14.5-15.5', MW42
1330	Stop drilling MW42 John H. suggests that well abandoned at 12:24 above was probably hitting bedrock. TD of Background Monitor well 42 is 15.5'. Plan to screen from 2-12'. Water table at 2'
1435	Finish Completion of MW42 (Background
1514	Set up at MW43 Background Site Start Drilling

8-18-88 Peter E Riemersma

8-18-88 64

Background MW42



341 PM or 1541	SS1, Laboratory 1-2' MW43
345 PM	HNU malfunctioning, will be returned to US Analytical Instruments
3:53 PM	SS2 Laboratory 14-15' Water table
4:14 PM	SS3 Laboratory, 23-24' TD
4:25 PM	Finish drilling
4:30-5:30	Work on preparing samples for Fed X
5:30 6:30	Unload van, go to airport to see about car rental payment

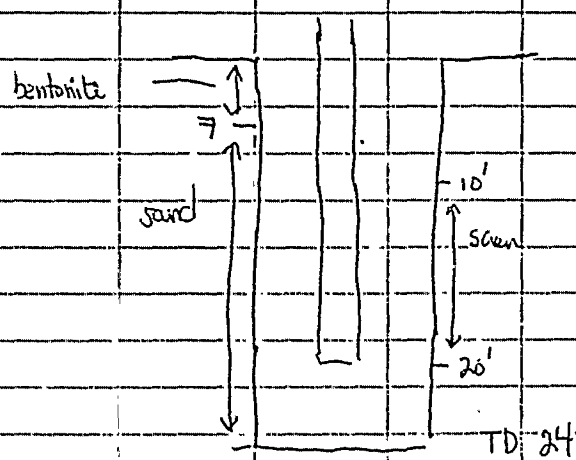
8-18-88 Peter E Riemersma

65 8-18-88

Summary

	Background MW42	MW43
total depth	15.5	24'
casing ft w/stickup	4.5	12.5
screen	10	10
base of screen	12'	20'
stickup	2.5	2.5
sand pack	15.5 - surface	7-24'
bentonite	—	7-0
grout	—	—

Background MW43



8/18/88 Peter E Riemersma

8-19-88 66

6.25 Cool day, blue skies, breeze to the SW
Calibrate HNU ASSET NO. 164716 Probe
NO. 501288 span setting 56 (3)
per instruction manual

7.15 AM ES Personnel | North Star
Peter Riemersma | J. Anderson
Mike Roddy
Jo Ann Sherwin
John Hardeman

PLAN - Peter R and JoAnn S are going to work the rig. Mike R is going to follow ~~A~~ Jeff A. on well completion. John H is going to review drillers completion sheets.

7.15-8.00 Peter R. and JoAnn S. go to buy aluminum foil

8.24 Start drilling DANGB-4-~~MW~~ WP 11D
North Star Drillers
John Anderson
Mike Rasinski

9.32 Have drilled to 23.5'.

9.57 Stop drilling Casing to 23.6 TD 24.3'
sand to 15'

10:25 (25) screen from 15-10
sand to 5'

8/19/88 Peter E Riemersma

5'10" WP ~~MW~~ 11D

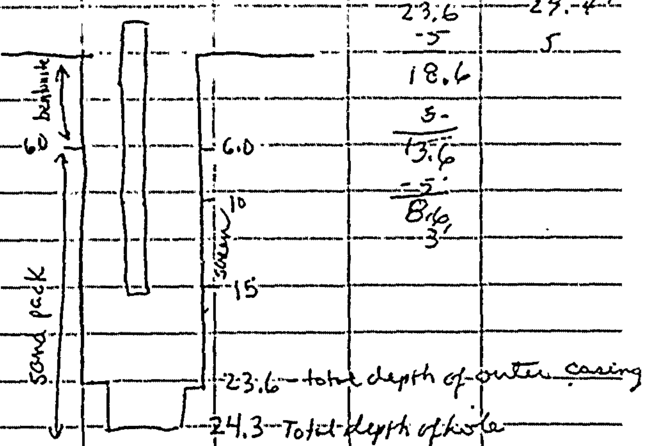
Start construction 10:11 - put sand from TD to 15'

50.9, 5 10, 44 9', 14 9", 15 6, 5 10, ~~11 8~~, 9 8

50.10', 20 10', 5 10', 15

casing 23.6 -5 18.6 5- 13.6 -5 8.6 -3

Table 5'10' 29.4" 5



10:23 Wait for clamps for centralizer, Stop construction
Water in ~~14~~ WP 11D at 7-9' is probably from surface
seepage through peat and pending above clayey silt

11.30 Start construction

12.20 End of Construction

12.35 Start Drilling WP 16D

1.59 Stop drilling WP 16D
TD at 24.4

PLAN Plan to screen 5-20
sand pack 11 - 24.4
bentonite 0-11

2:05 Start Construction

8/19/88 Peter E Reneiassa

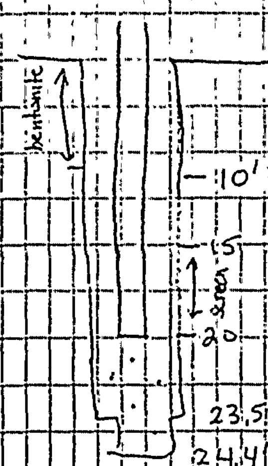
WP 16D

total casing 20+6 2' 17 10' 6.2 11 8"

49.9 19.1 6.2 13.1 ~~Fill~~

50.8 20.8 6.2 14 6'

casing at 23.5' -5.5 18.0 -6.4 11' 8"



3.05 Finish Construction of WP 16D

3.30 Start drilling MW23 Site 4
Water level at adjacent GW4C is 6.5', TD at 23'

3.41 SS-1 Laboratory 0-1' fill, d. brown
breeze to the southwest

4.18 SS.2 Laboratory 8-9', ~~clay~~ sand fine, some clay

4.58 SS3 Laboratory 30-31' sand

4.59 Complete drilling TD at 33'10"

Plan to Construct Well
Screen at 22-32
sand pack up to 18'

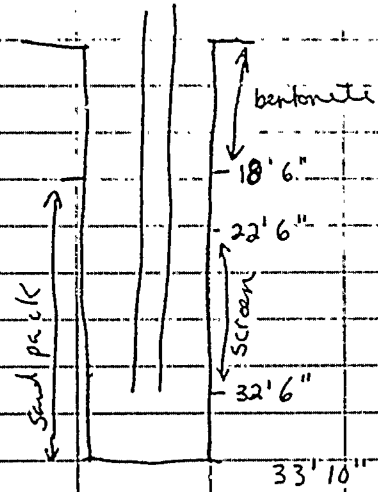
11+6'2" + 18'3" + (48'2") 8/19/88 Peter E Reneiassa

69 8-19-88

MW23 Site 4

SU... 18'6" to ...
24'9" ...
54'8"
55'4"

31
-5
26
-4
22
56'6"
26'6"
6'2"
20'4"



7:21 Well Completed

Summary

	WP11D	WP16D
Total depth	24.3	24.4
Casing ft w/stick	12.5	17.5
screen	5	5
base of screen	15	20
stickup	2.5	2.5
sandpack	6-24.3	10'7"-24.4
bentonite	0-6	0-10'7"
grout	-	-

8-20-88 70

6.30 Arrive at office, Weather is clear, Slight Breeze
ES Personnel
Peter Riemersma
Mike Roddy
JoAnn Slerwin
North Star
Mike Rasinski drill helper
John Anderson
Bill Erickson

7.50 Start drilling MW 22 Site 4
8:15 SS-1 Laboratory 0-1 peat
8:20 Record 150 ppm from borehole, adjacent well log notes fuel odor, adjacent well GW4D
Water table is at 7'
8:30 Water table est at between 5-7 feet, clay is very moist, ponding of water above clay and below peat very likely
8.35 SS2 Laboratory 5-6.7 clay, moist
peat
9.20 SS3 Laboratory 30-31' sand
9.35 Stop Drilling TD at 35 Bedrock at 32
PLAN screen 33-33.5 to 23-23.5
sandpack 35 to 19-20'
9.50 Start Construction Peter R. overseeing construction

8-20-88 · Peter E Riemersma

71

33.5'
5'10"
39 3"

5'10"
67 3"
37 3"
5'10"
31 3"

373"
5 10
31 5"

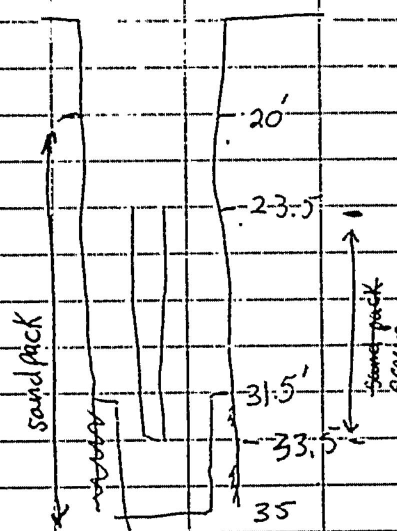
336"
236"
26' of casing needed

Outer Casing
31.5'
-5
~~26.5~~
-4
22.5

8-20-88 MW22

23'6"
5'10"
29'4"

2.6
5'10
2.6
3'4" → mark on connector



11.27 Finish Completion of MW22
1130-130 Move to new location and take Lunch

8-20-88 Peter E Riemersma

8-20-88   3' to 1 inch   72

23'6" + 5'10" = 29'4" sand top of screen

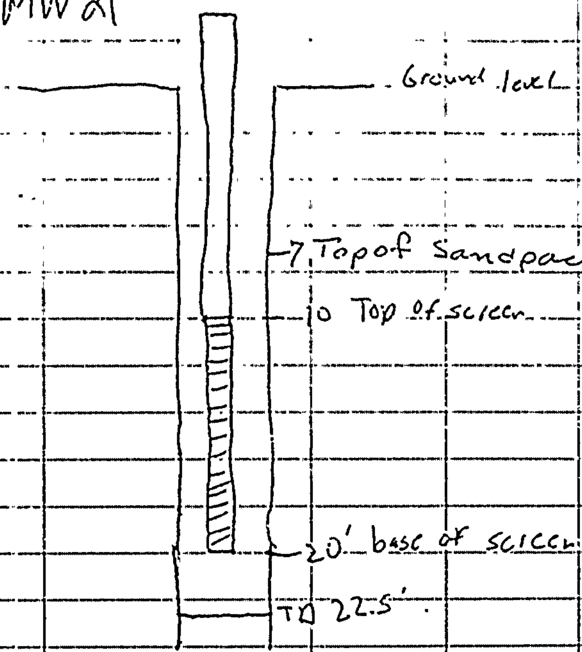
PLAN

36	Base of Screen	336" + 5'10" = 39'4"
6	Top of Screen	236" + 5'10" = 29'4"
66 / 36	Top of sand pack	20' + 5'10" = 25'10"
5'10 / 30'2"	Length of casing at table	
27.5'		10' + 26' + 3'4" of connector =
5'10 / 21'5'		5'10" 3'4" = 2'6"
29	1340	Start drilling MW21
23	1345	SS1 Laboratory 0-1' clay and silt
	1420	SS2 Laboratory 5-7 clay, wet
		Duplicate MP-21 3:20 same as SS2
	1455	SS3 Laboratory 18-19'
	1456	Stop drilling TD 22.5', bedrock 18'
	15:15	Start construction
	16.10	Stop Construction
		base of screen set at 20'
		Top of screen set at 10'
		Bill E. put soil augerings from MW22 into barrel since we recorded an elevated HNU reading from the borehole.
	16.39	Leave Site

8-20-88 Peter E Riemersma

MW21

8-20-88



Summary

	MW22	MW 21	Total
Total Depth	35	22.5	
Casing ft w/stick	26	12.5	
screen	10'	10	
base of screen	33.5	20'	
stickup	2.5	2.5	
sand pack	35-20'	22.5-7	
bentonite	0-20'	0-7	
grout	—	—	

8-20-88 Peter E Riemersma

6.30 AM Arrive at office, pack up van, decon bowls, spoons and buckets with help of Mike Roddy

Weather: Cloudy, foggy, hazy, rained last night, small breeze

Calibrated HNU ASSET NO. 500791
Probe NO. 500018
with SPAN (5) 34

8.25 Start drilling ~~HW~~ WP 12D near runway taxiway

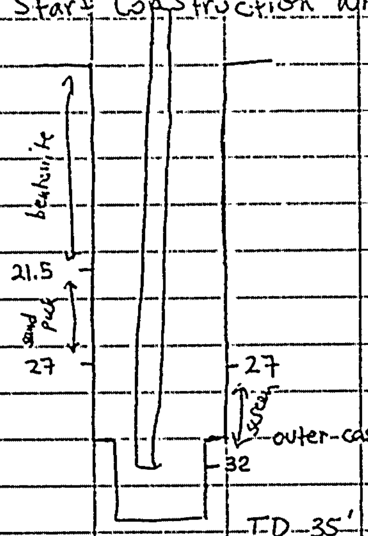
9.22 Have drilled to 25' and hit bedrock at

North Star
John Anderson driller
Mike Rasinski driller helper
Bill Erickson Health + Safety

ES
John Hardeman] on the rig
Peter Riemersma]
Jo Ann Sherwin] taking water level measurements
Mike Roddy]

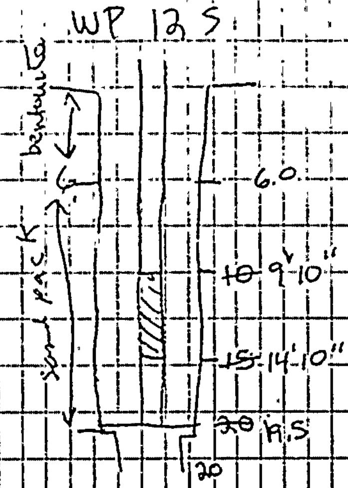
PLAN
screen 32-27 btm of screen 32+6"
sand pack top to 24
top of

10:30 Encountering difficulty in retrieving core
WP 12 D (Deep)
10.40 Complete drilling WP 12D TD at 35'
Start Construction WP 12D



11.27 Complete Construction WP 12D
12.26 Back from lunch, prepare to drill
adjacent shallow well 12S, raining - sprinkle
12.35 Start drilling WP 12 S
1.10 PM Stop drilling WP 12 S TD at 20
Start Construction
14:15 Finish Construction WP 12S
screen at 9'10" - 14'10"
sand pack up to 6'

8-22-88 Peter E Ramsay



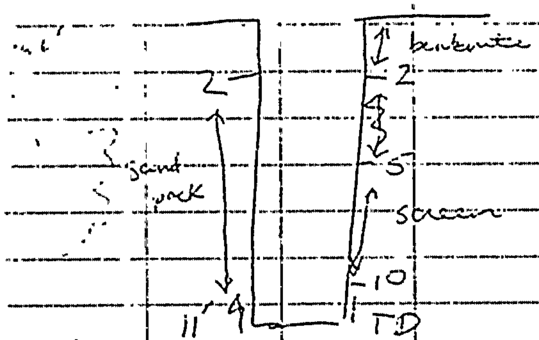
14.35 Start drilling WP 13 D (Deep)
15.20 Stop drilling TD at [illegible]
Start Construction
PLAN btm of screen 22
top of sand 10.5'
16.19 Finish C[illegible]
Begin drilling WP 13 S
16.35 Finish drilling WP 13 S
Begin construction
17.20 Finish Construction

Summary	WP12D	WP12S	WP13D	WP13S
Total Depth				11
Casing ft w/stick				
base of screen				

77

18-22-88

WP 13 S



8-22-88

8/23/88

73

6:30 a. Arrive at office, pack up van.

windy Weather bright and clear -

Sunrise shortly before 6:30

7:30 Wait for escort to drill site

8:25 Escorted to drill location

Geologists Peter Riesmersma, J. Ann Sherwin, Mike Roddy

8.34 Start drilling WP14D

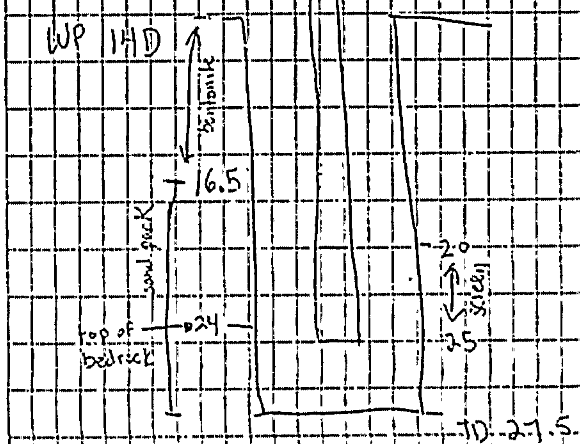
9.55 Finish drilling

PLAN 25 + 6'2" = 31'2"

Screen 25-20

sand pack up to 16 / 16 + 6'2' 22'2'

10:00 Start construction of WP14D



10.32 Finish Construction of WP 14D

8-23-88 Peter E Riemersma

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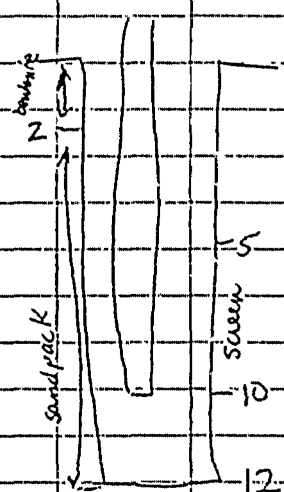
8-23-88

10.45 Move to WP 14S, approx. 6' west of 14D Plan to drill to 12', screen 5-10'

10.56 Finish drilling, Start Construction



11.24 Complete Construction of WP 14S

Lunch

12:30 Move to 4WP 15D

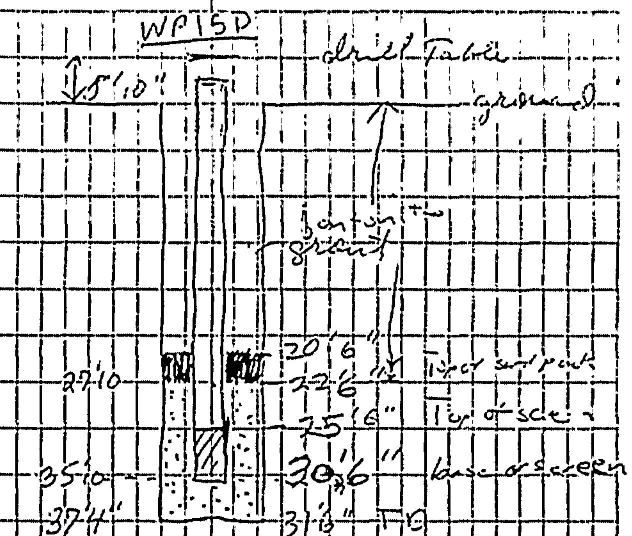
12:42 start Drilling 4WP 15D

1:00 Solid overcast gray sky

2:00 TD at 31'6"

Start well construction

8-23-88



Complete construction of 4WP 15D 15.18

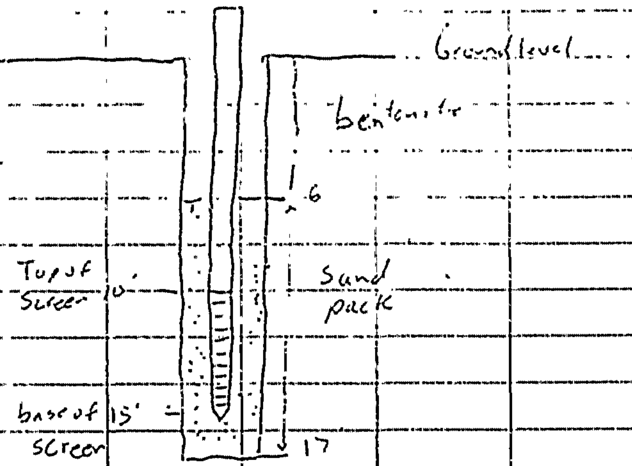
Start Drilling 4WP 15S 15.40

Drilling Completed 16.10

Start construction of 4WP 5S 16.15

Mike Roddy

8/23/88 4WP15S



16:42 Complete construction of 4WP15S
16:53 arrive at 4MW 24
17:55 Decide not to do 4MW24 - need
to decontaminate bit

8-23-88 Mike Roddy

8/24/88

6:30 Arrive at Office; weather is
partly cloudy & cool with slight breeze
6:45 load Van
6:59 Calibrate HNU ASSET NO. 500791
Probe No 500018 with Span
set at 18. Calibrated with 94.7 ppm
isobutylene supplied by Liquid Carbonic
batch # 9488-061588; Lot # 12

7:58 Start Drilling 4MW24
SS1 8:10 Depth 0-
SS2 8:20 Depth 3-4
North Star Personnel
John Anderson
Mike Rasinski (Drill helper)
ES Personnel
Mike Roddy
Jo Ann Sherman
John Hardeman
SS3 9:30 Depth 33'10" to 32'

9:45 Finish Drilling TD 37'

8/24/88

8.3 8-24-88

4MW24

10 to Start Well Construction set screen 35'

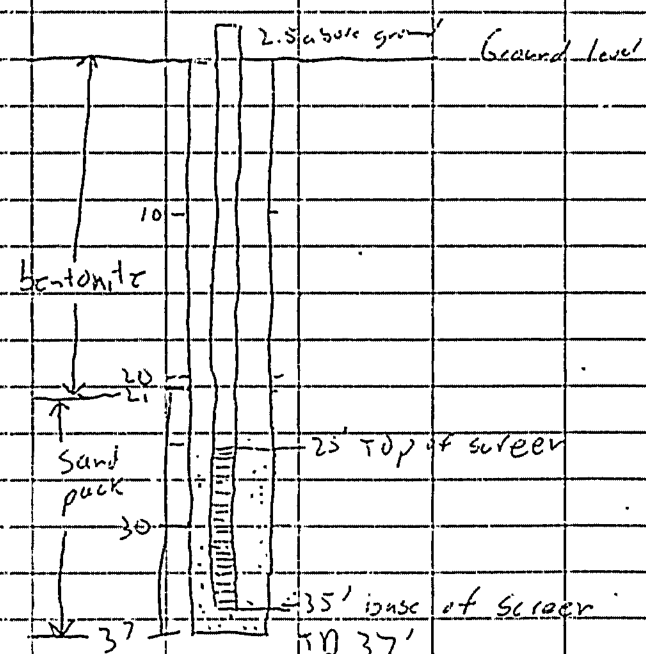
wait 45 minutes for SP-4 Truck to clear area

resume construction 10.57

Set screen 35'-25'

Sand pack 37'-21'

bentonite 21'- Surface



11 36 Well Completed

8-24-88 Mike Roddy

8-24-88 8.

11:43 Drive off well

12:02 Lunch

13:04 back from Lunch

Weather partly cloudy - Cool & breezy

13 40 arrive at 3MW25

Drill rig and water Truck both get stuck

15:00 Decide not to drill this hole at this Time

15 24 Start Drilling 3MW27

SS1 15 38 0-1'

16:05 finish Drilling TD 15'

SS2 16 10 5-6'

SS3 16 32 14-15'

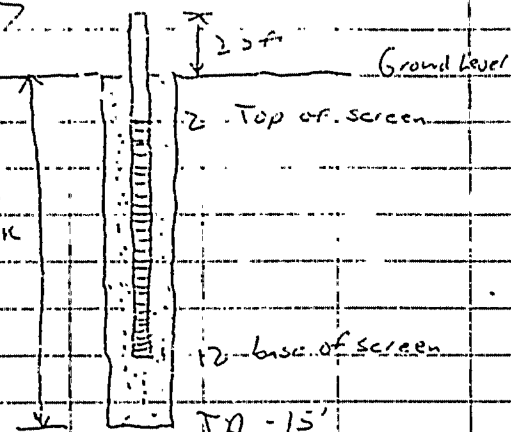
16:38 Start Construction

Set screen 12'-2'

8-24-88 Mike Roddy

8/24/88

3MW27



17:05 well casing pulled up
start over again
redo same as above
18:11 finish Construction well 3MW27
18:20 Attempt to set up on 3MW28
18:40 Give up - decide to wait till
Tomorrow morning

8/24/88 Mike Roddy

8-25-88

6:42 arrive on base
Weather clear & cool ~~sl~~ breezy 15 to 20

7:28 Calibrate HNU asset # 500791
probe # 500018 with span set at 0
Calibrate with 94.7 ppm isobutylene
supplied by Liquid Carbonic Carbonic
batch # 9488-061588 Lot # LL
8:00 start setting up at 3MW35
8:38 start Drilling SS1 8:50 SS2 - 8:53 2-3'
9:30 TD at 7.5' Decide to move hole
9:53 start Drilling
10:25 stop Drilling TD 14' go set gas
10:15 SS3A 10 - 11.5
10:25 SS 3 Duplicate
10:45 resume Drilling

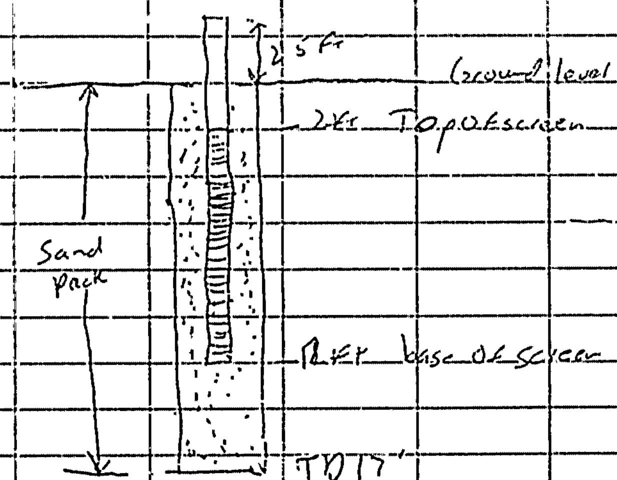
11:45 stop Drilling 17'

11:50 lunch break
12:48 back from lunch
ES Personnel at Rig North Star
Mike Ruddy John Anderson
John Hardeman Bill
Bob McLeod

8-25-88 Mike Roddy

8/25/88

12.50 Start Construction of 3MW35



·note 1 10ft screen damaged during 1st construction

13:46 Finish Construction of 3MW35

14:05 Reassure - Find screen only 6" below the surface - decide to reset well ~~Also~~ Reason

16:00 finish resetting well drive off - see above

16:35 Finish stringing fence

18:57 Drillers Decide not to do another hole

8/25/88 Mike Roddy

8/26/88

06:40 arrive on site

Weather partly cloudy cool and breezy

7:06 Calibrate HNU asset # 500791
probe # 500018 with span set at 0
Calibrated with 94.7 ppm isobutylene
supplied by Liquid Carbonic batch
9488-061588 Lot #12

7:50	Start Drilling		3MW25
8:16	SS1	0-1'	
8:20	SS2	2-3'	
8:53	SS3	14-15'	
9:02	Stop Drilling	TD 18'	

9:09 Start Construction 3MW25

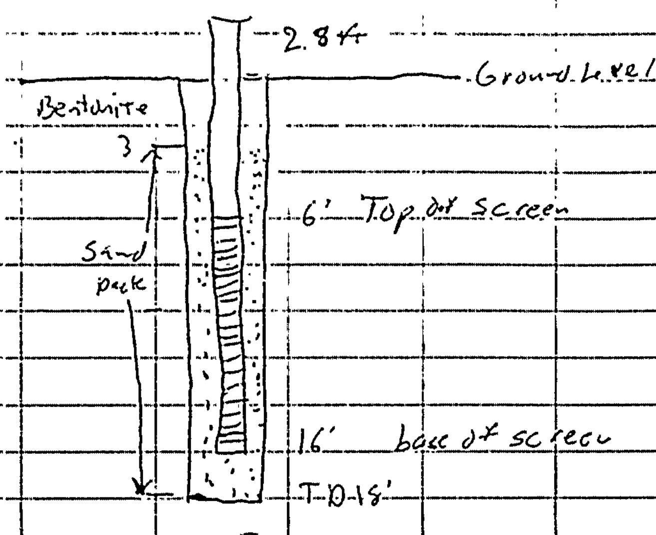
North Star Personnel at Rig	ES Personnel
John Anderson	Mike Roddy
Bill	John Hardeman

8/26/88

8/26/88

59

3MW25



9:48 Finish construction

10:10 Start Drilling DAN6B3MW26
11:04 finish Drilling TD 14.5 ft
11:20 Start well construction of
B3MW26

1:50 go get water
12:00 back from getting water

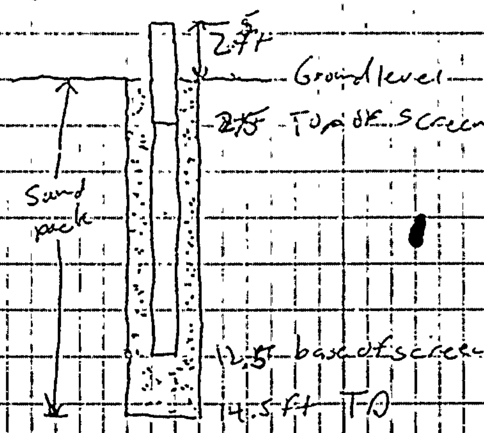
12:08 Decide to go to lunch
13:10 back from lunch

8/26/88 Mike Rodolfo

8/26/88

60

3-MW26



13:50 Finish well construction
Note: Construction had to be done twice
1 10ft screen damaged
14:30 pull off well & get water truck
out from being stuck - go to decon
drilling Equipment
15:00 back from decon
15:24 set up on 3 mw 30

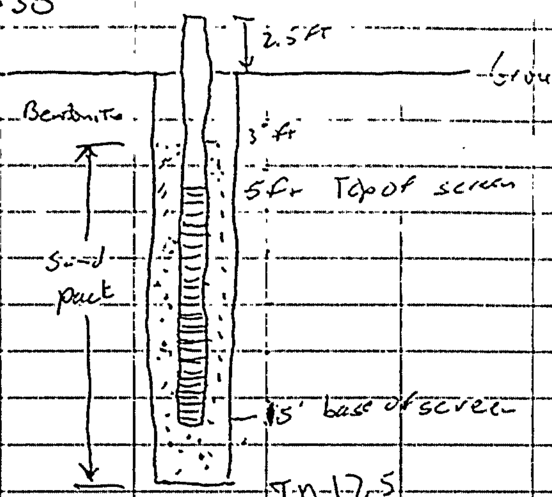
15:35 reset up on 3 mw 30

15:57 Start Drilling
16:52 Finish Drilling
17:00 Start Construction

8/26/88 Mike Rodolfo

9: 3MW30

8/26/88



18:10 Finish construction pull away from well

18:15 Check out next Location

8/26/88 Milo Rodd

8/27/88

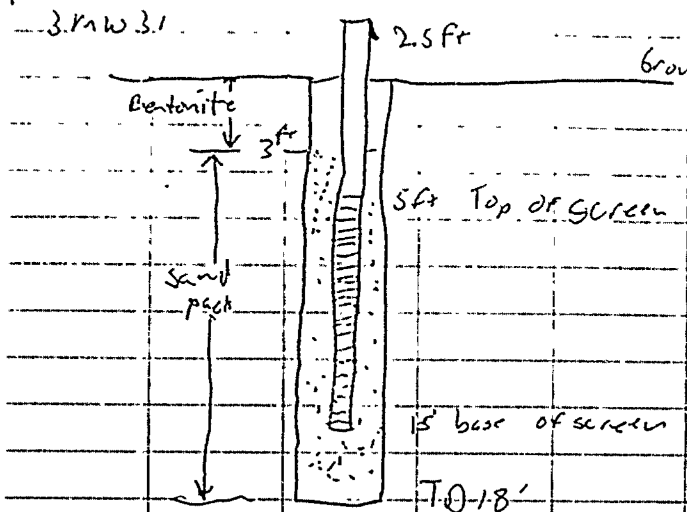
0640 Arrive on site
Weather partly cloudy, Cool, and breezy
722 Calibrate HNU asset No 500791
probe # 500018 with span set at 0
Calibrated with 94.7 ppm isobutylene
supplied by Liquid Carbonic batch
9488-061588 Lot # 12

748 Start Drilling 3MW31
8:25 SS1 0-4'
8:41 SS2 9-10'
note: SS3 not recovered by drillers
8:55 Finish Drilling TD 18'
9:05 Drillers go to decontaminate equipment
9:35 back from decon - begin well construction
9:48 Lose 10' PVC tremie pipe down hole
10:00 retrieve pipe
resume well construction

8/27/88 Milo Rodd

9.1

8/27/88



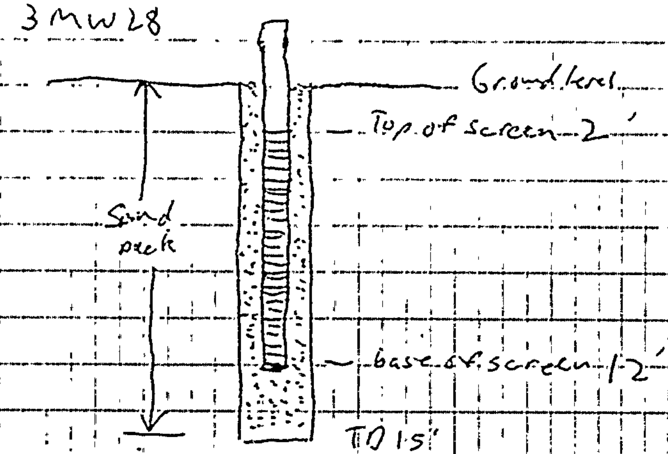
Finish well construction 10:32
10:45 going to get water

11:18 Set up on 3MW28
11:20 Start Drilling 3MW28
11:30 SS1 0-1
11:50 SS2 2-3'
12:05 SS3 14-15'
12:02 Finish Drilling TD 15'

12:25 Start Well Construction

8/27/88 Mike Roddy

8/27/88



12:59 Finish well construction on 3MW28
13:05 rig stuck
13:23 Get rig out
Lunch 13:30 - 14:15

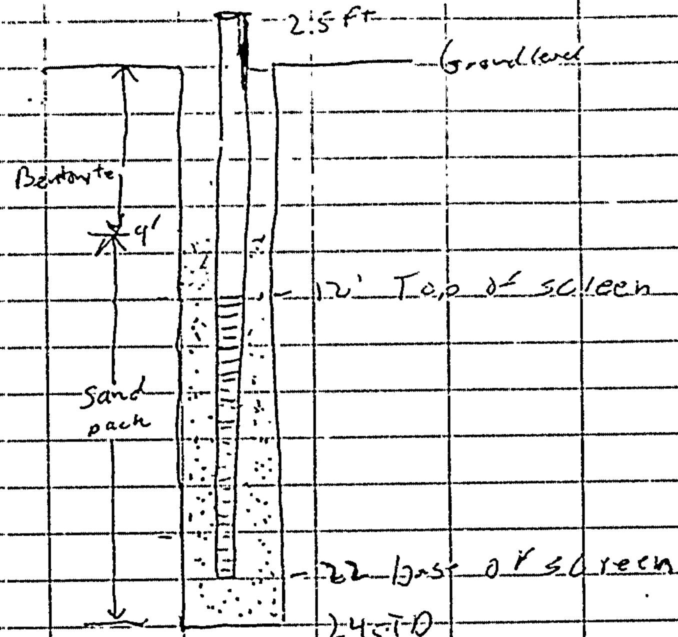
14:35 Start Drilling 3MW33
14:52 SS1 0-1'
15:25 SS2 11-12'
15:55 SS3 20-21'
16:00 Finish Drilling TD 24'

16:25 begin well construction

8/27/88 Mike Roddy

8/27/88

3MW33



Finish Construction 17:25
Drillers Drive off well location 17:38

8/27/88 Mike Roddy

8/29/88

06:40 arrive on site
Weather partly cloudy + cool slight breeze

7:11 Calibrate HNU asset NO 500791
probe# 500418 with span set at 9.0
Calibrated with 94.7 ppm isobutylene
Supplied by Liquid Carbonic batch
9488-061588 Lot #12

9:45 go to set up on 3MW34
9:55 batteries on rig dead - drillers take them to be recharged
10:40-11:40 break for lunch

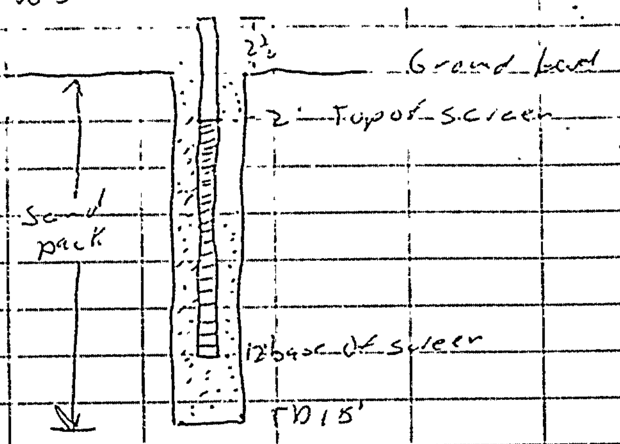
12:00 Start Drilling 3MW34
12:32 stop Drilling TD 15'

13:06 Start construction of 3MW34

8/29/88 Mike Roddy

97 8/26/88

3MW34



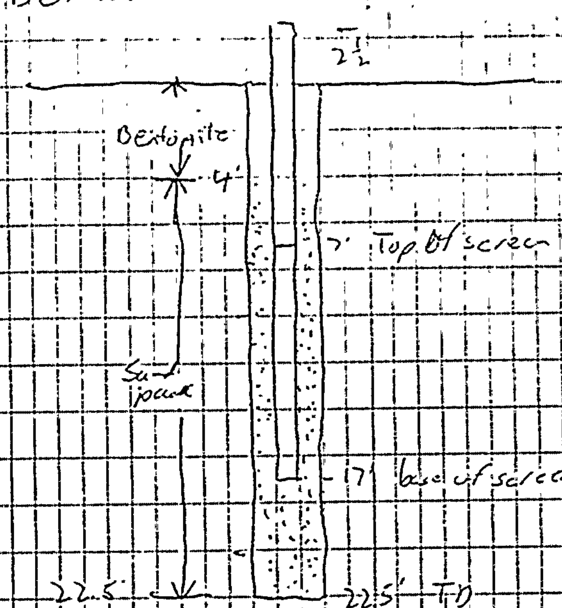
13:48 finish Construction of 3MW34
13:55 water truck stuck.
14:05 get water truck out
14:10 Driller goes to get water
14:30 Set up on BGMW32

14:42 Start Drilling BGMW32
14:50 SS1 2-3
15:40 SS2 11½-12
16:01 SS3 ~~20-21~~ 19-20'
15:58 finish Drilling TD 22.5
16:35 Begin Construction

8/26/88 Mike Kolb

8/29/88 98

BGMW32



17:32 Finish Construction
17:53 Driller move rig from well site
8:00 Discuss operational objective with Driller

8/29/88 Mike Kolb

99 8/30/88

0640 arrive on site

Weather Cool, partly cloudy, with slight breeze

0741 Calibrate HNU asset # 500791
probe # 500018 with span set at 9.5
Calibrated with 94.7 ppm isobutylene
Supplied by Liquid Carbonic Batch #
9444-061588 Lot #12

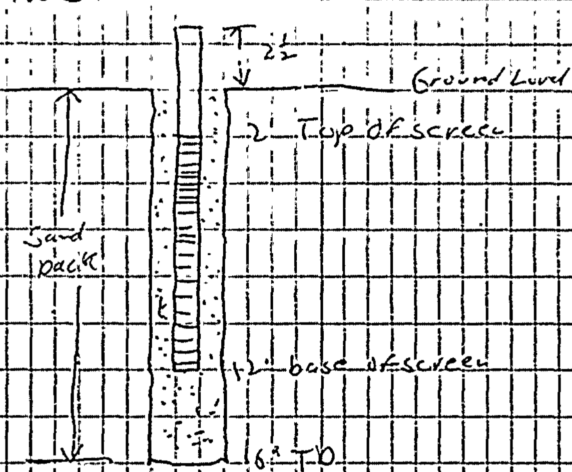
0745 Set up on 3MW29
0757 Start Drilling
0810 have to stop Drilling at 7' -- hole was skewed or twisted
0815 Start Drilling
0818 Stop Drilling 2" ...
0830 Start Drilling
0837 Stop Drilling 5' hole ... off

0920 Set up on new Location for 3MW29
0925 Start Drilling
0940 SS1 0-1'
0955 SS2 3-4'
10:00 SS3 14-15'
10:07 SS3A Duplicate 14-15'
9:54 Stop Drilling TD 16'

8/30/88 Mike Radcliff

8/30/88 100

10:05 begin Well Construction
3MW29



10:40 Finish Construction

11:02 Start Drilling MW30B

11:10 SS1 0-1
11:12 SS1A 0-1
11:24 SS2 9-11'

11:29 Finish Drilling TD 15'
11:30 SS3 14-15'

8/30/88 Mike Radcliff

101 8/30/88

start
11:48 D3 3 ft
11:51 finish
11:55 ~~DA~~ SGD3 2' SS1 HNU of sample <1 ppm
11:55 SS1A Duplicate
11.58 start Drill E3
12:00 Finish Drilling
12:00 SGE3 2' SS1, SS1A duplicate
HNU of sample <1 ppm
12:20 Lunch
13:10 back from Lunch - decon & sample prep

14:50 arrive at site 2 wait with Driller
For JH to show up

15:05 Set up on 2BH2
15:12 Start Drilling 0-1
15:20 2BH2 SS1 HNU - 300 ppm
15:30 2BH2 SS2 5-6' 400 ppm
15:40 2BH2 SS3 10-12' 350 ppm
15:45 2BH2 SS4 14-15' 150 ppm
15:50 2BH2 SS5 20' 40 ppm
15:55 2BH2 SS6 25' 0 ppm
15 58 stop drilling TD 27'

8/30/88 Mike Roddel

8/30/88 102

16.02 Start Drilling 2BH1
HNU of sample ↓
16:15 2BH1 SS1 0-2 400
HNU recorded 300 ppm 5 ft, 350 ppm 10 ft, 40 ppm 15 ft
16:20 2BH1 SS2 2-4'
16:20 2BH1 SS3 6-8'
16:30 2BH1 SS4 8-10'
16:40 2BH1 SS5 10-12'
16:40 2BH SS6 15-17'
16:45 2BH1 SS7 23-24' - HNU 290 ppm
16:50 Stop Drilling 2BH1 TD 24.5
16:50 → 18:30 prepare Samples for shipping
~~18:55~~ and take Samples to Fed X
18:55 Leave office

8/30/88 Mike Roddel

0645 arrive on site.
Weather Cloudy cool slight breeze
0711 Calibrate HNU asset # 50079
probe # 500018 with span set at 3.5
Calibrated with 94.7 ppm isobutylene
Supplied by Liquid Carbonic batch
9488-061588 Lot #12

0755 Start Drilling MW14
0820 Finish Drilling TD 25'
0820 SS3 10-12' HNU <1 ppm
0820 SS9 10-12' HNU <1 ppm Dup

0835 Drill 8MW20 2'
0838 stop drilling TD 3'
08:45 8MW20 SS1 0-2'
08:45 8MW20 SS5 0-2' Duplicate
8:55 - 9:40 pack samples

10:05 4MW24 SS1 0-2'
4MW24 SS19 0-2 Duplicate
10:45 BGMW32 SS1 0-1'
10:45 BG MW32 SS4 0-1' Duplicate
11:20 SG E4 SS1 0-2'
11:20 SG E4 SS2 0-2' Duplicate
8/31/88 Mike Rodd

11:40 SGC4 SS1 0-2
11:40 SGC4 SS2 0-2' Duplicate

11:55 Lunch break
12:45 back from lunch begin packing
Samples

1500 take water sample from de-ionizer
1540 Continue packing water sample for shipment
1700 Take samples to Fed X for shipment

17:45 Go to airport to pick up Airline tickets

8/31/88 Mike Rodd

06.45 Arrive at Office

Weather cloudy, cool, slight breeze, misty

07:05-7:40 Discuss what needs to be done by drillers

8:00-9:00 Fill out chart

9:20-10:10 check out Site 2 with Bill & Greg

10:10-10:35 Clean up around office

10:35-10:55 Clean up Van

11:30-12:09 Observe operational procedures of drillers regarding the fabrication of protective well casing and numeration of well caps

12:20-13:05 Lunch break

13:10-14:05 Wash bowls, spoons, buckets

14:10-14.50 Check Progress of Drillers; Assist in procurement of much needed supplies for Drillers

14:55-15:15 ~~Cle~~ Remove surficial deposits around office area for visual enhancement of office area

15:20-15:30 Meet with Drillers to review operational objectives

15 30-~~Bi~~ Proceed to Base Supply to secure Several packages recieved there

16:04-16:16 Discuss well nomenclature with Drillers - Numbering systematics resolved

9/1/88 Mike Rock

16:15-16:29 Unload packages from Van

16:30- Proceed to Site 2 to observe installation of

16:45 - Protective casing at 2WP7 & 2WP7D

17:20 Protective Casing for Monitoring Wells and Well Points dropped off at Site 2

17:45 Leave office

9/1/88 Mike Rock

107 9/2/88

7:00 Arrive onsite

Weather partly cloudy, cool w/ slight breeze rain clouds on the horizon

7:30 Discuss operational objectives with Bill and John - load cement to fill boreholes

8:08 leave for site 2

8:20-8:50 problems with grout truck

9:12 2BH1 and 2BH2 filled with cement

9:15-10:40 pulled protective casing in and do well casing measurements for site 2 → Ground to Top of casing

10:40 Drive over to decon area meet with Drillers - go back over to site 2

11:20 finish recutting protective casing for 2MW37

11:30 finish recutting and putting in place the protective casing for ~~BB~~ 2MW39

12:05 Install protective casing for BBMW43

12:15 Lunch break

13:13 back from Lunch

13:18-14:55 Drive around putting locks on protective well casing and do top of casing to ground measurements

15:30 leave for Airport

9/2/88 [signature]

Total Depth 31' bottom of casing
5.8" to top of table
36.8"
-14' Sandpack
22.8" from top of table

Things to do
Check WP for QA/QC samples needed for this

Analysis for Background Soils

SW 8010	Volatile Org	
SW 8020	Volatile	
SW 8270	Semi-Volatile	
SW 7060 As	Metals	
SW 6010 Ba	"	
SW 7131 Cd	"	
SW 7191 Cr	"	
SW 7421 Pb	"	
SW 7471 Hg	"	
SW 8080	Organochlorine	Pesticides
	PCB's	
EPA 418.1		

CURVE TABLES

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HOW TO USE CURVE TABLES

Table I. contains Tangents and Externals to a 1° curve. Tan. and Ext. to any other radius may be found nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and External: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table I.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

EXAMPLE

Wanted a Curve with an Ext. of about 12 ft. Angle of Intersection or I. P. = 23° 20' to the R. at Station 542+72.

Ext. in Tab. I opposite 23° 20' = 120.87
120.87 ÷ 12 = 10.07. Say a 10° Curve.

Tan. in Tab. I opp. 23° 20' = 1183.1
1183.1 ÷ 10 = 118.31.

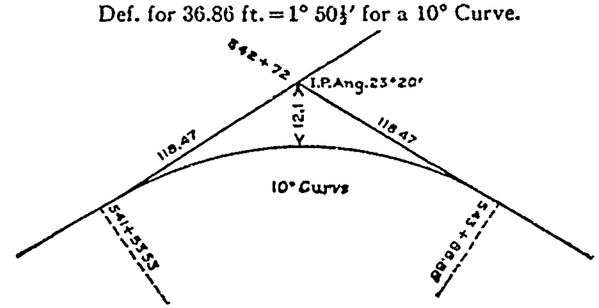
Correction for A. 23° 20' for a 10° Cur. = 0.16
118.31 + 0.16 = 118.47 = corrected Tangent.

(If corrected Ext. is required find in same way)
Ang. 23° 20' = 23.33° ÷ 10 = 2.3333 = L. C.

2° 19½' = def. for sta. 542		I. P. = sta.	542+72
4° 49½' = " " " +50		Tan. =	1 .18.47
7° 19½' = " " " 543		B. C. = sta.	541+53.53
9° 49½' = " " " +50		L. C. =	2 .33.33
11° 40' = " " " 543+86.86		E. C. = Sta.	543+86.86

100 − 53.53 = 46.47 × 3' (def. for 1 ft. of 10° Cur.) = 139.41' = 2° 19½' = def. for sta. 542.

Def. for 50 ft. = 2° 30' for a 10° Curve.
Def. for 36.86 ft. = 1° 50½' for a 10° Curve.



46½' 16½" 18' 7½'
37' 3½"
27
10' 3½"
5' 8"

48.7
9' 1½"

46 2
6 6
35 8

27'
5' 8"
32' 8"

putting bentonite in 7 ½ in tape through tubes into bucket fill tubes up then fix amt you want into bucket then pump into wall until bucket is empty then quickly get hose out of well

37 3½"
32 8"
4' 7½"
6.5
71.5

7.25

69.7
49.7
6.5
43.2

67.9
27.1
6.5
1.4

46.2
6.5

screen 10' 3"
9' 10"
19' 8"

20' 1"
39' 9"
1' 9"
41' 6"

2.6
2.2

20
40
6.5
66.5

46 10"
16 10"
6 4
10' 6"

1½ at each

40 9" casing
1' 9"
42' 6"

46.2
7 7/8

46 2½ to top of plate 5' 8"
− 6½ 6"
39' 6½
8½"

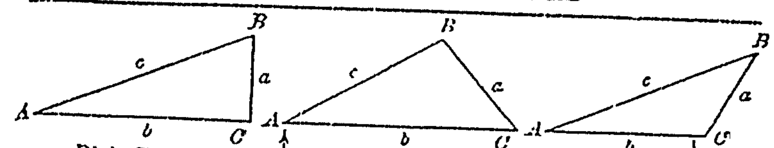
1) put btm sand pack in
2) put screen & casing in
put measuring tape down inside of to find its total length
3) mark where top of land surface should be on pipe – keep it at that level
4) pour sand in, some casing up

34
35.6
5 8
29 10

27
5 8
32' 8"

Check on verticalness of hole
47' 10"

TRIGONOMETRIC FORMULÆ



Right Triangle — Oblique Triangles

Solution of Right Triangles

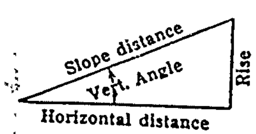
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B,\ c = \sqrt{a^2+b^2} = a\sqrt{1+\frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B,\ b = \sqrt{(c+a)(c-a)} = c\sqrt{1-\frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90°-A,\ b = a\cot A,\ c = \frac{a}{\sin A}$.
A, b	B, a, c	$B = 90°-A,\ a = b\tan A,\ c = \frac{b}{\cos A}$.
A, c	B, a, b	$B = 90°-A,\ a = c\sin A,\ b = c\cos A$,

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a\sin B}{\sin A},\ C = 180°-(A+B),\ c = \frac{a\sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b\sin A}{a},\ C = 180°-(A+B),\ c = \frac{a\sin C}{\sin A}$
a, b, C	A, B, c	$A+B = 180°-C,\ \tan\frac{1}{2}(A-B) = \frac{(a-b)\tan\frac{1}{2}(A+B)}{a+b},\ c = \frac{a\sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2},\ \sin\frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}},\ \sin\frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}},\ C = 180°-(A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{bc\sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2\sin B\sin C}{2\sin A}$

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10'. From Table, Page IX. cos 5° 10' = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft. Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10' = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance $= 302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.

XII

Natural Trigonometrical Functions

Angle.	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
° ′							° ′
32	.5299	.6249	1.1792	1.887	1.600	.84805	58
10	.5324	.6289	1.1813	1.878	1.590	.84650	50
20	.5348	.6330	1.1833	1.870	1.580	.84495	40
30	.5373	.6371	1.1857	1.861	1.570	.84339	30
40	.5398	.6412	1.1879	1.853	1.560	.84182	20
50	.5422	.6453	1.1901	1.844	1.550	.84025	10
33	.5446	.6494	1.1924	1.836	1.540	.83867	57
10	.5471	.6536	1.1946	1.828	1.530	.83708	50
20	.5495	.6577	1.1969	1.820	1.520	.83549	40
30	.5519	.6619	1.1992	1.812	1.511	.83389	30
40	.5544	.6661	1.2015	1.804	1.501	.83228	20
50	.5568	.6703	1.2039	1.796	1.492	.83066	10
34	.5592	.6745	1.2062	1.788	1.483	.82904	56
10	.5616	.6787	1.2086	1.781	1.473	.82741	50
20	.5640	.6830	1.2110	1.773	1.464	.82577	40
30	.5664	.6873	1.2134	1.766	1.455	.82413	30
40	.5688	.6916	1.2158	1.758	1.446	.82248	20
50	.5712	.6959	1.2183	1.751	1.437	.82082	10
35	.5736	.7002	1.2208	1.743	1.428	.81915	55
10	.5760	.7046	1.2233	1.736	1.419	.81748	50
20	.5783	.7089	1.2258	1.729	1.411	.81580	40
30	.5807	.7133	1.2283	1.722	1.402	.81412	30
40	.5831	.7177	1.2309	1.715	1.393	.81242	20
50	.5854	.7221	1.2335	1.708	1.385	.81072	10
36	.5878	.7265	1.2361	1.701	1.376	.80902	54
10	.5901	.7310	1.2387	1.695	1.368	.80730	50
20	.5925	.7355	1.2413	1.688	1.360	.80558	40
30	.5948	.7400	1.2440	1.681	1.351	.80386	30
40	.5972	.7445	1.2466	1.675	1.343	.80212	20
50	.5995	.7490	1.2494	1.668	1.335	.80038	10
37	.6018	.7536	1.2521	1.662	1.327	.79864	53
10	.6041	.7581	1.2549	1.655	1.319	.79688	50
20	.6065	.7627	1.2577	1.649	1.311	.79512	40
30	.6088	.7673	1.2605	1.643	1.303	.79335	30
40	.6111	.7720	1.2633	1.636	1.295	.79158	20
50	.6134	.7766	1.2661	1.630	1.288	.78980	10
38	.6157	.7813	1.2690	1.624	1.280	.78801	52
10	.6180	.7860	1.2719	1.618	1.272	.78622	50
20	.6202	.7907	1.2748	1.612	1.265	.78442	40
30	.6225	.7954	1.2779	1.606	1.257	.78261	30
40	.6248	.8002	1.2808	1.601	1.250	.78079	20
50	.6271	.8050	1.2838	1.595	1.242	.77897	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	Angle

Angle.	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
° ′							° ′
39	.6293	.8098	1.2868	1.589	1.235	.77715	51
10	.6316	.8146	1.2898	1.583	1.228	.77531	50
20	.6338	.8195	1.2929	1.578	1.220	.77347	40
30	.6361	.8243	1.2960	1.572	1.213	.77162	30
40	.6383	.8292	1.2991	1.567	1.206	.76977	20
50	.6406	.8342	1.3022	1.561	1.199	.76791	10
40	.6428	.8391	1.3054	1.556	1.192	.76604	50
10	.6450	.8441	1.3086	1.550	1.185	.76417	50
20	.6472	.8491	1.3118	1.545	1.178	.76229	40
30	.6494	.8541	1.3151	1.540	1.171	.76041	30
40	.6517	.8591	1.3184	1.535	1.164	.75851	20
50	.6539	.8642	1.3217	1.529	1.157	.75661	10
41	.6561	.8693	1.3251	1.524	1.150	.75471	49
10	.6583	.8744	1.3284	1.519	1.144	.75280	50
20	.6604	.8796	1.3318	1.514	1.137	.75088	40
30	.6626	.8847	1.3352	1.509	1.130	.74896	30
40	.6648	.8899	1.3386	1.504	1.124	.74703	20
50	.6670	.8952	1.3421	1.499	1.117	.74509	10
42	.6691	.9004	1.3456	1.494	1.111	.74314	48
10	.6713	.9057	1.3492	1.490	1.104	.74120	50
20	.6734	.9110	1.3527	1.485	1.098	.73924	40
30	.6756	.9163	1.3563	1.480	1.091	.73728	30
40	.6777	.9217	1.3600	1.476	1.085	.73531	20
50	.6799	.9271	1.3636	1.471	1.079	.73333	10
43	.6820	.9325	1.3673	1.466	1.072	.73135	47
10	.6841	.9380	1.3711	1.462	1.066	.72937	50
20	.6862	.9435	1.3748	1.457	1.060	.72737	40
30	.6884	.9490	1.3786	1.453	1.054	.72537	30
40	.6905	.9545	1.3824	1.448	1.048	.72337	20
50	.6926	.9601	1.3863	1.444	1.042	.72136	10
44	.6947	.9657	1.3902	1.440	1.036	.71934	46
10	.6967	.9713	1.3941	1.435	1.030	.71732	50
20	.6988	.9770	1.3980	1.431	1.024	.71529	40
30	.7009	.9827	1.4020	1.427	1.018	.71325	30
40	.7030	.9884	1.4061	1.422	1.012	.71121	20
50	.7050	.9942	1.4101	1.418	1.006	.70916	10
	.7071	1.	1.414	1.414	1.	.70711	45
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	Angle

1) include time of all lab analysis samples, interval which they are from, short description
2) Time start drilling, time stop
3) Completion of borehole – name, terminated at — feet

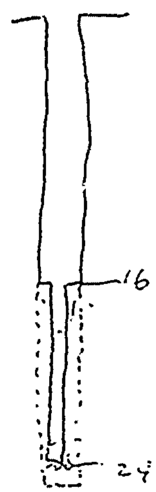
Peat from 9 – 13

64 2"
442"
57"
, 1

5-10 3

24 0 ~~9~~

36 20-25



Q.2.3 Notebook 3, Assistant Field Team Leader

This notebook contains Site 2 pace and compass measurements on existing well locations, and the locations of the trench FTA-1; rounds 1 and 2 of water level measurements; well development records; shallow soil sampling at Site 3 and records of HNU readings for Site 8 shallow soil boreholes.

Eighty two pages of this notebook were used. The first entry is July 26 1988 and the last is September 2, 1988. This notebook is signed by Jo-Ann Sherwin.

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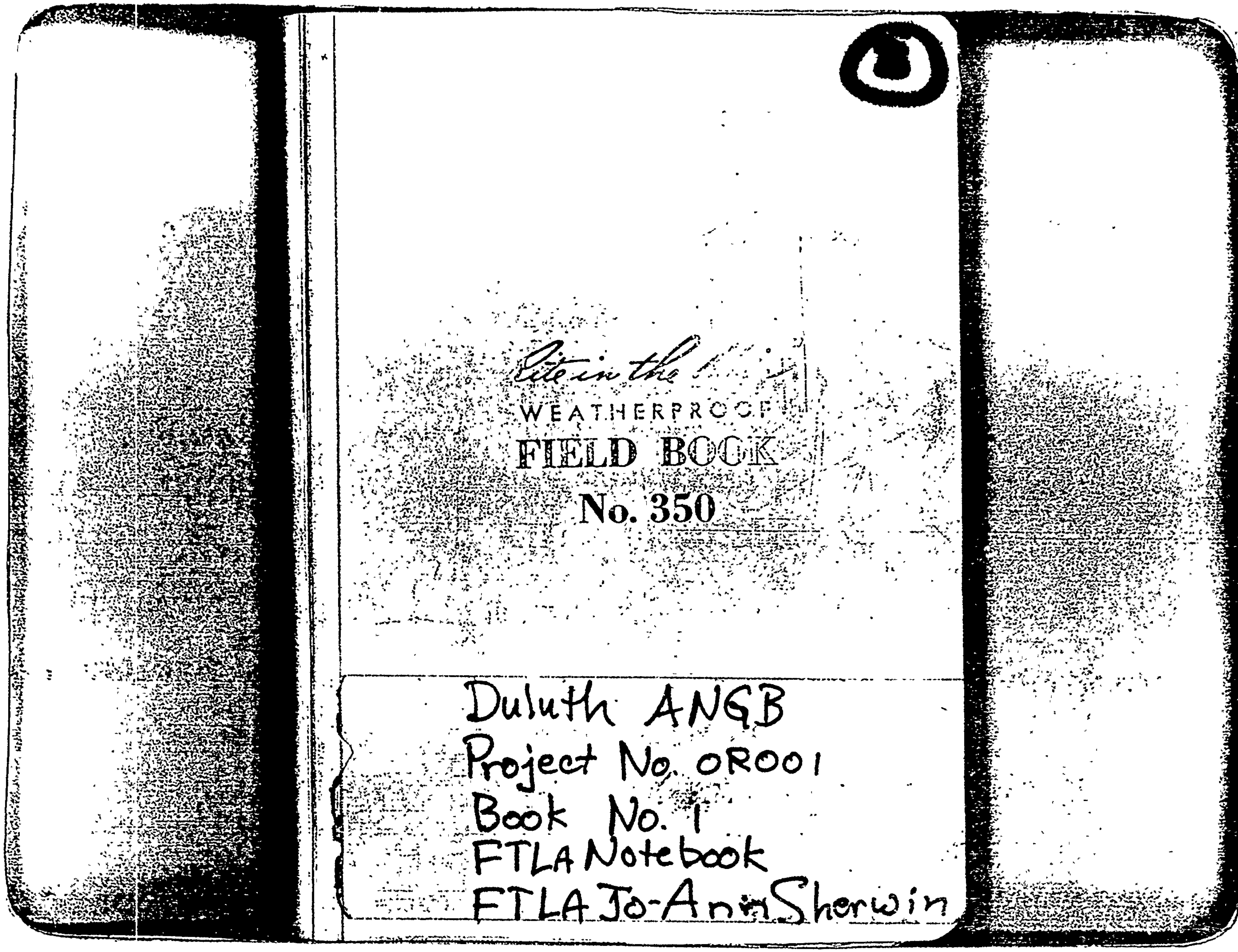
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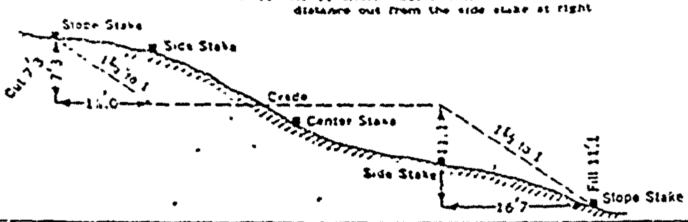
No. 350
Duluth ANGB
Project No. OR001
Book No. 1
FTLA Notebook
FTLA Jo-Ann Sherwin

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7 the distance out from the side stake at right



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	38.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	66.6	66.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	33
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.1	40

RETURN TO: ROBERT S. McLEOD
ENGINEERING SCIENCE
710 S. ILLINOIS AVE
SUITE F-103
OAK RIDGE, TN 37830
(615) 481-3920

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Page 1

CONTACTS

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Col. Don Sakold Hq. Mn ANG 612-296-4673
Sgt Jim Norton Duluth ANG (CE)
(utilities) work control x 292
Sgt. John Wedlund facility Mgr (CE) x 408
Sgt. Harold Stevens supply x 293
Bill Hayden ES-Deputy PM O.R. 615-481-3920
Larry Janssen HAZWRAP 615-576-1967
Tom Sturdivant HAZWRAP 615-482-6601
Enrique Gentzsch MPCA
Site Response 612-296-7803
Elizabeth Gaworys MPCA Site Response 612-296-7821
Ed Grunwald H&S Mgr ES 404-325-0770
Tom Oothoudt- North Star Dvlg O 612-632 6552
H 612-632-2306
Melanie Baltizore, Berkeley Lab O 415-841-7353
H 415-937 5368
Kathlene Kidd Berkeley Lab H 415-939-9475
Bruce Bucke (utilities Civ. El.) 218-723-7294
Graves (Danny) Drilling Shop 879-2076
old shop 624-4344

Page 2

EMERGENCY CONTACTS

Base Main Gate Security 723-7280
Fire Dept 723-7233
Poison Control 1-800-332-3073

MEDICAL EMERGENCY
Hospital / St. Lukes Hospital of Duluth
ADDR 915 East 1st St. Duluth, MN
PHONE (218) 726-5555

BASE POC Maj Joel Manns
CE MN ANG
W (218) 723-7290
H (218) 728-2633

ES
P.M. R.S. McLeod
ES OR TN (615) 481-3920
Apt. 615-483-4613
Home (404) 953-9603
HSO Ed Grunwald
ES Atl GA (404) 325-0770

Page 3

SAMPLING EQUIPMENT USED

Item	Eqpt	Asset#	Serial No
1	HNU PI 101 Field PID	566791	701235
	Probe & Pump	500018	M 1144
2	HNU PI 101 Field PID	164716	601988
	Probe & Pump	501288	707031
3	Gastech Explosimeter		CX4994
	THREE way gas alarm		
	G x 82		
4	Biosensor II		C-611-1182
	Explosimeter		
5	Foxboro OVA 128. GC	500452	50654

4

July 26, 1988

Arrived on site at 12:35 p.
Met Ed Grunwald, John Hardeman, Kim Davis, Peter Riemersma in airport restaurant for lunch

2:00p. arrived at hanger. Met Martin Marietta representative Tom Sturchand, who works for Automated Sciences.

3:00p. Observed decontamination initiation of drill rig about 4:30p. there were problems with water pressure. Plain steam insufficient for cleaning. Alconox added.

8:00p. Dinner w all above people plus Dennis Forsberg, QA person from M.M. Discussion of application of NQA 1 to all DOE projects. Disussed construction of wells & the advisability of tieing in (cementing) pad to well casing. Problem of frost heave against pad causing destruction of integrity of shallow wells in particular separation of

Jo Ann Sherwin 7/26/88

The screen from the well OR itself. Perhaps a new design where the pad was separated from the well by a buffer of bentonite would protect the integrity of the well. If the design were changed this would have to be approved in writing by the properly authorized parties. At present there is no clearly understood field change procedure

Jo Ann Sherwin 7/26/88

July 27, 1988

7:30 a. Met at hangar c J. Hardeman, K. Davis, P. Riemersma, T. Sturdivant, D. Forsberg also present.

Prepared for taking water level readings c K. Davis.

Obtained key for wells.

Prepared personal field equipment

Calibration of HNu meter #500791 procedure observed by D. Forsberg, T. Sturdivant, K. Davis; procedure done by J. Hardeman using procedure described in Instruction Manual #601213 provided by US Analytical Instruments ~~Co~~ for Model # PI 101

Span set on 5, for 11.7eV
Battery O.K.
Pump is operating reading ~150

Jo Ann Sherwin 7/~~26~~ 27/88

7.

New Span is
E. 2 → 3.32

Calibration gas info:
from Liquid Carbonic
Date: June 15, 1988
Content 94.7 ppm Isobutylene
Bal air
Batch # 9488-061588
Lot # 12
Certified by SL

#

Weather info
Started out cloudy, in 70's., By mid-day bright, clear skys, a slight breeze.

#

Jo-Ann Sherwin 7/~~26~~ 28/88

8.

FAA Standards as brought to our attn. by Sgt Denney

← 75' →

37½'

118'-37=81' ✱ ← 75' →

total wingspan largest aircraft
747 236'
½ of this is 118'

=

Any permanent above ground construction needs to be outside of 500' of runway or else it has to have breakaway couplings.

=

Jo-Ann Sherwin 7/~~26~~ 27/88

9.

Well #

Time 11:12

0 ppm HNu reading

Stop indicator set on 5

Well#	Time	HNu Reading	TOC	TOSC	total depth
GW 2E	11 12	0ppm	~~13.22'~~ 13.22'	~~13.03~~ 14.03	
~~GW 2D~~	~~11:23~~				
GW 2D	11·23	0 ppm	13.54	~~13.5'~~ 13.42	23.48 (below TOC)
GW·2E	11:40		13.15	13.98	20.25

10.

Remarks.

John Hardeman took readings, hand protection worn, decontamination done.

Unlocked well casing cap, well above casing. Was this original construction or due to frost heave. #1 did readings & decontamin

2nd Reading, Kim Davis operator

Break for lunch. Equipment decontaminated by Kim Davis before return to field according to procedures described in work plan.

OJT in water level measurement given to J. Sherwin & Kim Davis by J. Hardeman

Used electronic water indicator calibrated by manufacturer to 1 foot intervals. Obtained additional information by using an engineers scale accurate to 100ths of an inch. This is different from the work plan as described on pg. 2-9 Sec 2.2.6 which says "An electronic water-level indicator accurate to 0.01 feet will be used to measure the depth to water."

Decontamination procedures differ from those in the work plan and are described in Kim Davis field notes this date.

J. Sherwin 7/27/88

Jo Ann Sherwin 7/27/88

Well	Time	HNU	TOC	TOSC	T.D.

difficulty locating existing wells on site #2
proceeded to use tape & compass to relocate wells
data on following pages

J. Sherwin 7/27/88

Remarks

John Sherwin 7/27/88

13

Remapping Data

GW2-C to MW-4 — S ~~#~~33° ~~W~~ E
~~121.2'~~ 122.2 — N28°W (BS)

GW2-C to B2-9 — S 10°W
237.5 ~~236.5~~

MW-4 to B2-9 — N 37°E
161.3 ~~160.3~~ — S 37°W (BS)

B2-9 to MW-5 — S 27°E
151.9 ~~150.9~~ — N 23°W (BS)

MW-5 to GW2-B — N 40E
217.7 ~~216.7~~ — S 39W (BS)

MW5 to MW6 — S78W
144.0 ~~143.0~~ — N82E (BS)

~~MW6~~ to GW2A — S82W
198.0 ~~197.0~~ — N83E (BS)

MW5 to GW2A — S83W
N84E (BS)

J Sherman 7/27/78

14.

GW2A to MW7 — N27E
110.6 ~~109.6~~ — S28W (BS)

Finished at 6:15 p.m.
Scattered clouds
Temperature around 75°F
Pleasant.

Field assistant Kim Davis

Shut HNU Meter off & left at hangar.
Closed & locked windows at hangar.

Data Reduction using map scale & 40 Ruler scale.

$\frac{400}{452} = \frac{x'}{x} = \frac{\text{map}}{\text{ruler}}$ or $x = x' \times 1.13$

		x	x	
GW2-C to MW-4		137	121	S30E
GW2-C to B2-9		267	236	S10W
MW-4 to B2-9		181	160	N37E
B2-9 to MW-5		171	151	S25E
MW-5 to GW2-B		245	217	N40E

JoAnn Sherman 7/27/78

15

			x	x'	
MW-5	to	MW-6	162	143	S80W
MW-6	to	GW2A	223	197	S82W
MW-5	to	GW2A	—	—	S83W
GW-2A	to	MW-7	124	110	N27E

J. Sherwin 7/~~28~~ 27/88

16

July 22, 1988

Procedure used to obtain water level readings
At Start of Day
① Calibrate HNU wrap probe in plastic
② Decontaminate water level indicator & wrap in aluminum foil.
③ Obtain key for wells &/or fenced areas
④ Take maps rubber gloves plastic trash bag small HPLC & Methanol bottles
tape measure calibrated to teflon 100ths.
⑤ Take large drinking water jug, large refill HPLC & Methanol bottles, machete measuring tape, compass ruler & personal field gear & OFF.

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At each well

(1) Unlock cap
(2) Take HNU reading as inner cap is lifted
(a) ~~check~~ set indicator on 0-200
(b) stand upwind or to the side
(c) return HNU to standby, put plastic back on probe.
(3) Put on protective gloves
(4) Set water level indicator at 5.
(5) Lower tool in hole until sound is heard, adjust until spot where sound just begins is determined. Take foot reading use tape measure to read hundreths. Read from where fingers mark to nearest side of foot marker on tool. This measurement is TOC.
(6) Repeat for TOSC (outer protective casing)
(7) Lower tool to bottom of hole or until line goes slack. Adjust to spot where weight of tool is barely perceptible. Record reading as above, and note whether reading is from TOC or TOSC

Turn off sloped indicator

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(8) decontaminate ~~gloves then~~ line, then probe by washing down with methanol & rinsing with HPLC water. Place on plastic, do not permit probe to touch ground.
(9) Dispose of gloves in plastic bag.
(9a) Recap TOC
(10) Take additional measurements such as TOSC to ground or TOSC to top of pad
(11) Note general condition of well
(12) ok Lock TOSC

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The weather is bright & clear, no clouds - it is in the 70's at 8:30 a.m and supposed to get quite hot. It is quite breezy.

Recalibrated HNU (K. Davis) after lunch and before taking readings at Sites 3, 4 & 8.

All readings at Site #2 were 0 ppm the first time the well was opened. Water level readings were taken at two wells (GW2-E & GW2-D) on two successive days. On the 2nd day the readings were >0 ppm.

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21 SITE #2 TOC = inner casing J.S. 9/29

Well	Time	HNU	TOC	TOSC	T.D	TOSC to top of Pad	top of pad & ground	Remarks. 22
GW2-D	9:30a	50 ppm	13.57 (-.11)	13.46	23.43' (TOC)	1.66'	0.6'	Distance between ground & bottom of pad varies between 0.13'-.15'. Thickness of pad approximately 0.45'
GW-2E	10:12a	75 ppm	12.93 (+.76)	13.69	20.18 (TOC)	1.67'	0.59 / 0.63	Grnd & bot of pad .15' Grn to top of pad - Thickness of pad approx .45'
MW-1	10:31	0 ppm	15.32 (+.01)	15.33	26.19 (TOC)	1.79		→ TOSC to grnd surf. Pad has disintegrated & is now a heap of weathered cement
MW-2	10:55	0 ppm	12.56 (+.14)	12.60	26.29 (TOC)	1.79		This hole is mislocated on the map. TOSC to grnd surf. Pad has disintegrated to small rubble pile. There is no lock on this well.

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23.

Well	Time	HNU	TOC	TDSG	TD
GW2-C	11:17	0 ppm	13.99	(-.11) 13.88	23.98
MW-4	11:30	0 ppm	12.97	12.97	22.98
MW-5	11:45	0 ppm	20.14	(+.02) 20.16	22.29
GW2-B	11:58	0 ppm	10.62	(-.11) 10.51	14.40
MW 6	12:09	0 ppm	13.02	(.03) 13.05	16.14
GW 2-A	12:21	0 ppm	11.41	(-.12) 11.29	12.39
MW-7	12:30	0 ppm	11.00	(+.03) 11.03	22.06

Finished at 12:42 Lunch break.

24.

TOC to Pad top	Top of Pad to Ground	Remarks
2.28	.50	Bottom of pad to ground about .04' small separation. Liner ~~cap~~ cap cracked & open
2.14 →		No pad, small dirt mound.
2.43	.75	Cement pad weathered away from ground. Appears as an inverted cone, casing can be shaken from side to side. Gloves decontaminated & stored in separate plastic bag. Will be reused for all following wells
2.51	0.56	Off ground about .12
2.93 →		No pad small weathered pad
2.49	.46	Pad sitting directly on ground
2.34 →		Concrete pad sitting in ground at ground level

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25.

Site # 3

Well	Time	HNU	TOC	TOSC	ID	TOSC to Top of Pad	Top of Pad to Grd	Remarks
GW3-C	3:55	4 ppm	9.24	(+.37) 9.61	21.39	1.99	.41	Cap broken into 3 parts - one part missing. Pad off ground about .08
GW3-B	4:10	1 ppm	11.40	(+.14) 11.54	22.00	2.45	.45	Cap crack in half Separated ~1/8". Correction there is a 1/8" saw cut in top of cap. Pad is completely on ground.
GW3-D	4:23	0.5 ppm	8.21	(+.72) 8.93	19.13	2.07	.52	.07 off the ground
GW3-A	4:35	0.5 ppm	13.60	(+.07) 13.67	18.14	2.68	.42	1/8 inch saw cut in cap. Pad off ground by about .05

Finished site # 3 at 4:43 p.

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J. Sherwin 7/28/88

27. SITE # 4 28

Well	Time	HNU	TOC	TOSC	TD	TOSC to top of pad	Top of pad to grnd	Remarks
MW-8	4:59	1.0	8.22	(+.10) 8.32	15.47	2.79 →		To ground. No pad, no pile of any other material
MW-9	5:14	1.0	8.16	(-.03) 8.13	15.56	2.97 →		Well slightly mislocated on map, farther from corner of fence than shown. To ground. No pad or any weathered material
GW4-D	5:42	0.5	11.22	(-.01) 11.21	26.09	2.51	1.04	1/8" cut in top of cap. New gloves used for this reading & all subsequent readings this day. 0.6 bottom of pad to ground
GW4-C	5:53	1.0	11.53	(0.00) 11.53	22.67	2.64	0.49	1/8" cut in top of cap about 0.1 from bottom of pad to ground
MW-11	6:00	0.5						Water level indicator test indicates instrument not working. No readings taken. End of measurements.

Jo Ann Sherwin 7/28/88

Jo Ann Sherwin 7/28/88

Located all other wells at Site 4.

Water level indicator may need new batteries: takes 3 AA.

Stop at Target to get batteries, screwdrivers, pliers & adjustable wrench.

Jo-Ann Sherwin 7/28/88

July 29, 1988

Start work 7:00 a.m.
Weather partly overcast. Occasional drizzle

Put batteries in water level indicator and it tests out O.K.

Kim Davis calibrated HNU.

Will take rest of water level measurements by myself this morning. All previous measurements taken this book done by Kim Davis & J. Sherwin (includes remapping site 2 north of road)

9:00 a. Bought pocket watch. Delay in start of drilling ~~then~~ Rejoined by Kim Davis.

Redo Site #4 from beginning ~~Not to~~ Not so. Since today's readings for MW-8 were within 1/100 of yesterdays readings Decided to not ~~redo~~ redo MW-9, GW4-D & GW4-C
J. Sherwin 7/29/88

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SITE #4

* TOSC = outside casing
TOC = inside casing

Well	Time	HNU	TOC	TOSC	TD
MW-8	9:24	~~0.2~~ 1.0	8.23		15.46
MW-10	9.38	1.0	7.14	(0.00) 7.14	15.09
MW-11	9:47	70 ppm	9.00	(+.14) 9.14	16.64
GW4-A	10:00	1.0	9.13	(−0.10) 9.03	20.59

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TOSC to top of pad	Top of pad to grnd	Remarks
		See previous page & day
2.98 →		No lock. No pad or grout visible ground flat. Looks like well might have been hit by equipment or vehicle. It is no longer vertical. A reflector is now wired to the protective casing. Pipe is now at 80° to the ground.
1.86 →		This well was disturbed yesterday as readings were attempted but water level indicator was not working. Bottom sediments were stirred up. Pipe goes into ground. No pad or grout seen
2.48	.47	Vented cap (0.2) ~~thickness of pad~~ + 0.15 = .37, is thickness of pad; 0.1 distance to ground.

J. Sherwin 7/29/88

Well	Time	HNU	TOC	TDSC	TD
GW4-B	10:19	1.00	8.06	(+0.32) 8.32	23.28

END OF SITE #4

START OF SITE #8

Well	Time	HNU	TOC	TDSC	TD
GW8-B	10.38	1.00	~~8.25~~ 9.65	(-.12) 9.53	21.86
GW8-A	10:49	1.00	8.90	(+.39) 9.29	15.11
GW8-C	11:00	1.00	10.85	(-.09) 10.94	19.48

END OF SITE 4

~~Ell~~

Finished taking readings at 11:07a

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TDSC to top of pad	Top of pad to ground	
2.76	.59	lock present but unlocked, cap vented Bottom of pad is about .2 off the ground
2.65	.5	cap vented. About .15 from bottom of pad to the ground
2.17	.53	Cap vented. Bottom of pad to ground = .17 Pad clearly off the ground all the way around.
2.63	.57	Cap vented About .15 from bottom of pad to ground. Pad off ground all the way around.

J. Sherwin 7/29/88

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Aug 2 1988

Start work ½6 a.m. cloudy coolish

Surveying in all other holes

w Linda Davis & Peter Riemersma

8:00 a.m.

Working on holes Site #2,

North of road.

Establish new base point

from MW-4 & GW2-B.

from ~~MW-4~~

MW-4 to base point 60 S5?W

~~200'~~ 201.0' N5?E (BS)

GW2-B to base point S?W 17

~~201.7~~ 202.9 ~~S?W~~ N?E (BS

MW-2 to base point ~~S3E~~

220' 7 N?3W (BS)

Must (BS) here since MW-2 surround by iron pipe

1' needs to be added to all previous linear measurements since JS did not hold 0' at start point. She held -0.0' at point. She held all previous start points. DONE @ 10:25a J. Sherwin 8/2/88

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MW-2 to MW-1 ~~N22E~~

152' S?5W BS

use BS because of 21

culvert iron lying around

MW-2

MW-~~X~~1 to GW2-E 67 N?3E

182.7' S60W (?)

GW2-E to GW2-ED S5?

139.1 50

Possible soil boring 7.4' from GW2-ED It consists of stick with red flagging grouted in ground. No numbers visible on stick.

GW2-D to possible boring S47E

4.4' 41

~~SB~~2-C to GW2-D 70 N67E

142.6 S63W

Finished Site 2 at 10:10a

Tried to locate ~~MC~~ MW-3 and could not

Also tried to locate S-2A, S-2C and S-2B as shown on Fig. 4.1

J. Sherwin 8/2/88

and could not find them.

The bermed area on map does not correspond to relationship between bermed area and location of wells as observed in the field.

The FTA north of the road had a foul smell this morning and oil sheen and bubbles were observed in some of the standing puddles which formed as a result of yesterdays rain and excess water from grouting of two holes in the center of the area.

Site #3

GW3-D to SW corner of shed S ~~86~~ 80°E
137.7°

GW3-D to Marker in parking lot S38W
19.8 N38E (BS)
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Marker to GW3-B 90 S87W
48.6 N85E (BS)

Marker to GW3-C 56 S48W
76.8 N51E (BS)

GW3-C to GW3-B 25 N19E
41.3

Marker to GW3-A ~~S14E~~
138.0 4 ~~N10~~ N10W (BS)

(BS) is better measure due to visibility

Finish Site 3 at 11:40 a

Site 8

NE corner of Quonset hut to GW8B 58 S52W
155.2 N52E

GW8-B to GW8-A 80 S86E ~~N86E~~
302.1 N86W

GW8-A to ~~252.8~~ GW8-C N15E S16W
~~Flag to~~ 252.8 (BS) ~~N15E~~

Flag to GW8-C NS S8E
~~GW8-A~~ 239.8 ~~GW8-C~~ N5W

Finished 12:25p

(BS) = Back sight
JS = J. Sherwin
KD = Kim Davis

J. Sherwin 8/2/88

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Site #4

	N9E
MW 8 to SE Shed① corner	~~N3E~~
187.6	
MW-9 to NE Shed① corner	~~N 3 E~~ N12E
74.6	~~S 7 W~~ S13W (BS)
MW-9 to fence corner	N2W KD
89.9	N3W JS
Fence corner to GW4-D	N65W KD JS
302.3	
MW-9 to GW4-D	N52W ~~N52W~~
No distance recorded	S53E

All readings on this day prior to this reading need to be made consistent w/ readings previous day & following marks set opposite previous readings. This day JS Brunton was used. Previous day JH Brunton was used.

GW4-D	to	GW4-C	
	217.5		(BS) N77E KD N75E JS
GW4-C ~~GW4-C~~	to 105.4	MW-11	S35W KD S34W JS
GW4-C ~~GW4-C~~	to 177.2	GW4-B ~~GW4-B~~	S16W KD S15W JS

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MW-11	to GW4B	S8E
	85.5	N16W(B
MW-10	to Shed② SW corner	N81E(JS
	172.6	N80E KD
MW-8	to GW4A	S60W KD
	200.0'	N63E(B

Corrections made. 6° Added to N×E readings. 6° Subtracted from N×W readings

Finished at 5:00 p.

J. Sherwin 8/2/88

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August 3, 1988

6:30 a Start work

Plot holes on aerial photos. Merkod - JS plots them on plain white paper. KD transcribes them to aerial photos using pin method.

Chat w Enrique - the Minnesota pollution control person.

finish 7:30 p

J. Sherwin 8/3/88

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August 5, 1988

Start work 6:30a Rain chilly

Search for boundaries of ETAD-1. Literature search in preparation for using backhoe.

Weston report. MW-5, MW-6, MW-7. These holes are mislocated on their map. Actual distances between holes is 1/2 - 3/4 the distance shown. The only hole which in rough analysis shows anything but very minor contamination is MW-5 or Table 4-1 (pg 4-7)

Weston report shows:

MW-4	0.42	15.9	5.6
MW-5	0.75	28.0	44.6
MW-6	0.27	15.4	24.6
MW-7	0.38	126.3	17.0
	oil&grease mg/L	TOX ug/L	TOC mg/L

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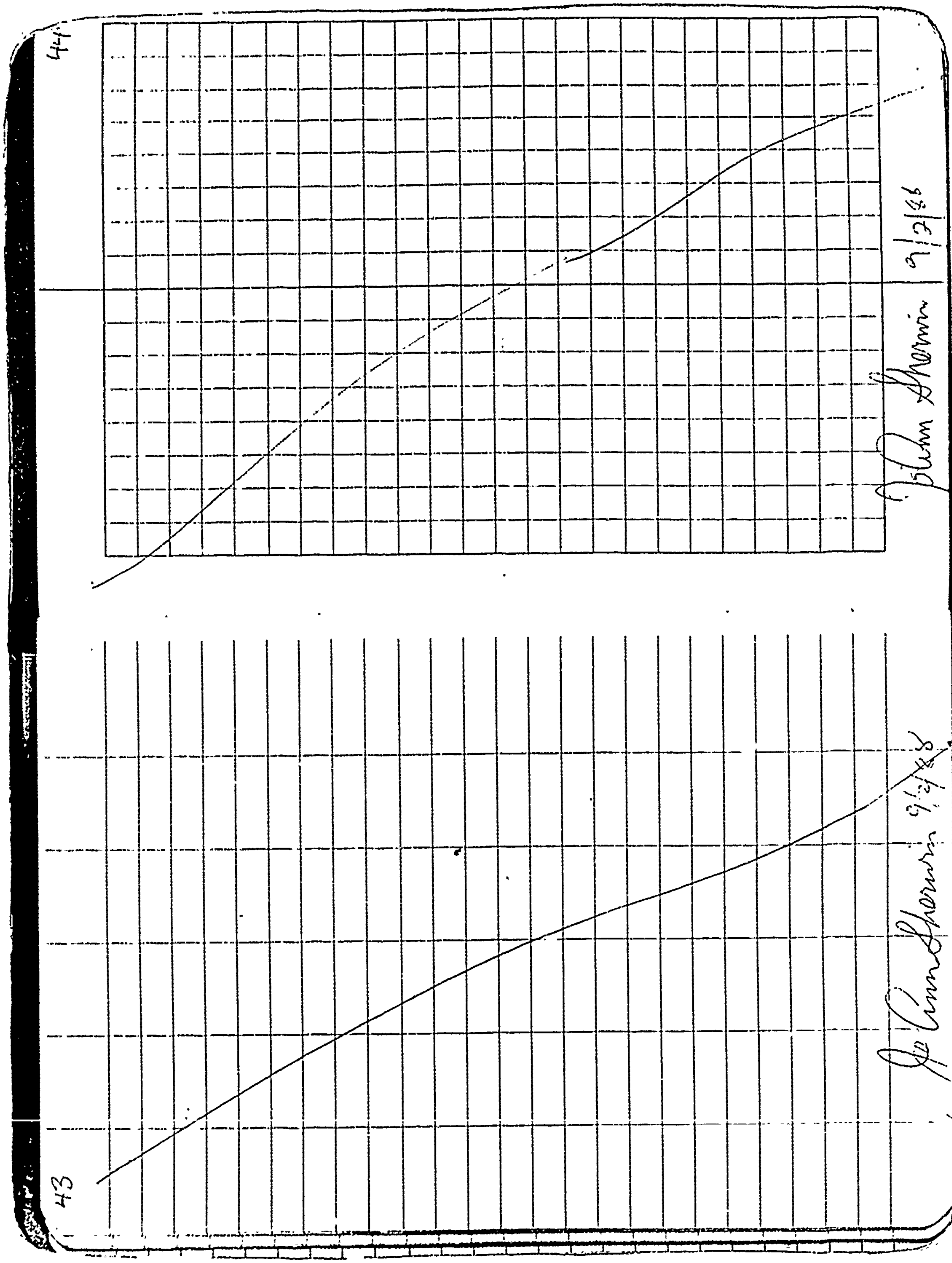
44
John Sherwin 9/2/48
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John Sherwin 9/2/48

2:30p Searching FTA-2-1 with backhoe

4:00p Finished

Nothing found

J. Sherwin 8/5/88

August 6 1988

Start work at 7:30a

Nice, sunny day, sunrise about 6:15a light breeze

ES personnel: J. Sherwin, Peter Riemersma and Kim Boers

Drillers: Jim & John

Midwest North Star.

Decon equipment and rigs from yesterday.

Start drilling WP-10 at 8:00a

Reached 35' at 10:00a.

An airport authority person came up and explained that all fence gates must be kept locked. Flagrant violators would receive a $1000.00 fine. It is O.K. to leave open a gate that is within one's constant view as we had done with the gate to Site 8. The problem was with

J. Sherwin 8/6/88

the gate over by the decon area that the drillers had left open. Our view of it is blocked by the Jiffy set but I said we would take care of it right away. He said he was going back by that area and would close it. We 3 ES people do not have a key to that gate. Will tell the drillers at the first opportunity that all gates must be kept shut & locked.

11:30a Bedrock at 45.0' drilled to 47.5'
Lunch
Set well point.
Drilled shallow well to 20'
Helped log core, discussed well with Peter. Finished at 4:10p.

Kim Davis & I went back to Site 7 to measure the distance between MW-1 & GW2-D with a tape

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MW-1 to GW2-D | ① E-W ~~S5?W~~ ② S56E ~~S82E~~
160 + 112.8' = 272.8

Done w K. Davis doing measurements, & unaware of my previous theory. Measurements are not completely accurate since a berm obstructs visibility between the two wells, and a small shed close to MW-1 may also intrude ~~on~~ a small way on the line of sight.

Left Duluth IAP at 5:00p.

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8/8/88

Start work at 6:30a.
Peter Riemersma
J. Sherwin
Kim Davis.
Started drilling at 8:00a.

8/9/88

Measuring in trenches at Site ~~B1~~ FTA2-1

From	To	Distance	Azimuth	Notes
MW-5	5	167.9	S39E	
MW-~~X~~5	6	183.0	S50E	
6	3	59.5	S12E	#4 missing –
6	1	111.2	S16E	the number –
6	32	142.0	S24E	not the hole –
6	13	134.3	S41E	No hole given
6	12	131.2	S60E	this number.
6	14	171.3	S43E	
6	2	97.3	S27E	
6	7	35.4	S53E	
6	8	35.1	N79E	
6	9	79.2	N89E	

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From	To	Distance	Azimuth	Notes
6	10	93.0	N87E	
6	16	126.9	N89E	
6	11	102.9	S81E	
6	15	150.5	S84E	
6	17	144.6	N61E	
6	18	173.2	N68E	
6	31	144.2	N24E	
6	30	87.4	N11W	
6	29	104.0	N26W	
6	28	156.6	N18W	
28	MW5	96.8	S71W	
28	26	144.3	N55W	
28	25	96.0	N2W	
28	24	178.9	N12E	
GW2-B	25	66.5	S48W	
GW2-B	24	35.5	N16W	
GW2-B	23	61.2	N26E	
GW2-B	33	159.1	N78E	
GW2-B	34	147.7	~~S53E~~	S73E
~~28~~26	27	86.1	S89W	Use for Check measurement
MW-5	27	157.9	N46W	Use this for #27
21	22	121.4	S61W	
21	20	45.1	S26W	
22	33	87.3	S54E	No hole # 19

misnumbered

J. Sherwin 8/10/88

1 ✓	2 ✓	3 ✓	4	5 ✓	6 ✓
7 ✓	8 ✓	9 ✓	10 ✓	11 ✓	12 ✓
13 ✓	14 ✓	15 ✓	16 ✓	17 ✓	18 ✓
19	20 ✓	21 ✓	22 ✓	23 ✓	24 ✓
25 ✓	26 ✓	27 ✓	28 ✓	29 ✓	30 ✓
31 ✓	32 ✓	33 ✓	34 ✓		

No holes numbered 4, 19

~~Were~~ Mismumbered & these numbers were skipped -

done by J. Sherwin,

finished at 11:50

J. Sherwin 8/10/88

8/11/88

Cloudy, overcast. 70's.

9:40 Starting backhoe work to locate FTA2-1

Didn't find anything

12:10 lunch

Hnu readings on Site 8

Hole #	Reading	Comments
A0	0 ppm	2.4' deep
A1	0 ppm	2' deep
A2	0 ppm	went down 2'
A3	0 ppm all	3 post holes - depth 3'6" water in the (4" diam), 1 6" diam holes 1' deep
B0	0 ppm	1.7'
B1	0 ppm	1.8' deep (1.7' deep)
B2	0 ppm	1.8' deep
B3	0 ppm	1.6' deep
C0	0 ppm	1.7' deep
C~~X~~1	0 ppm	1.5 deep
C~~X~~2	0 ppm	1.4 deep
C3	0 ppm	2.0' deep
D0	0 ppm	1.6' deep
D1	0 ppm	1.4' deep

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Hole #	Hnu Reading	Comments
D2	0 ppm	1.4' deep
D3	0 ppm	1.7' deep
E0	0 ppm	1.3' deep
E1	0 ppm	1.4' deep - perhaps .4' mud & water odor
E2	0 ppm	2 holes, 1.1', 1.2' deep.
E3	0 ppm	2.1' deep
F0	0 ppm	1.9 deep
F1	0 ppm	1.2' additional (total 1.6') mud & water in bottom .4'
F2	0 ppm	1.3' deep
F3	0 ppm	1.4' deep

J. Sherwin 8/11/88

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3/16/88

Start 6:30
Start soil borings - hand augering at Site 3 at 8:30a
Clear, Sunny light breeze
J Sherwin & Mike Rowdy doing the sampling. ~~Start~~ Samples at only the following points will be attempted

	Number	Time	Depth	Vol.	Soil	Remarks
	~~B1~~	~~8:45~~	~~1.2~~	9:50	10:00	~~4 tries, change sample~~
	-A1					
*	A0	1:45	1.9	1:50	1:55	(1.7-1.9) sample easy digging
*	A1	1:15	2.3	1:35 ~~12:20~~	1:40 ~~12:25~~	easy digging
*	A2	12:15p	1.9	12:20	12:25	easy digging
*	A3	2:00p	1.8	2:10	2:15	samples (1.6-1.8)
	A4					
	A5					
	B2					
*	B1	12:40p	1.8	12:50	12:55	easy digging
*	B3	2:50	1.7	3:00	3:05	sample 1.5-1.7
*	B3.5	3:30	2.0	3:35	3:40	Sample 1.8-2.0

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Number	Time	Depth	VR	Sol	Remarks
*B4	3.15	1.7	3:20	3:25	2 tries samples 1.5-1.7
*C Ø1	11:15	1.3	11:25		6th try 5 holes to .7' or less
*C O	10.50	2.0	10:55	11:00	no gravel, all soil
*C2	8:45	1.2	9.00	10.00	4 tries, channel samples
*C3	10:15	1.8	10:25	10:35	easy sample.
C5	~~10:45~~		~~10:55~~	~~11:00~~	~~No gravel, all soil~~
D1					
D2					
D3					
D4					
D5					
~~D.5.3~~					
E1					
E2					

prefix 355 used on all samples.

~~D/E3~~

D/E 3

Volatile

Samples with an asterisk (*) beside them are labeled 8/15/88 which is incorrect. It should be 8/16/88

Finished sampling at 4:00p.

Arrived at hotel at 7:30p. J. [illegible]

8/~~15~~ 22/88 JS.

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1 Water level samples.

J. Sherwin & M. Riddy

gray drizzly day

Hole #	Time	# Sppm	Water Level Depth	Remarks
MW2	8:35	0	12.57	no lock on well
MW1	8:43	0	15.57	
GWRE	8:50	0	12.70	
GWRD	8:56	0	13.91	
GWRC	9:08	0	9.94	TOSC to grd 1.70 TOSC to TOC 0.05 steel casing temporary drill casing and will be pulled
GWP7D	9:22	0	3.33*	No outer casing 0.2' TOC to ground
GWP7	9:25	0	3.46*	No outer casing 0.35' TOC to ground
GW2C	9:31	0	12.48	
MW4	9:35	0	10.41	TOC to ground 2.43 no protective casing yet
GMW41	9:43	0	10.[illegible]3	
MW28				
GW7	9:51	0	7.50	
GW2A	9:56	0	8.84	

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Well #	Time		TOC to water	Remarks
MW6	10:01	O	7.15	
MW5	10:05	O	8.27	
GW2 B	10:08	O	8.44	
2MW33	10:12	O	7.99	2.53 TOC to grnd
2MW27	10:17	O	4.75	1.46 TOC to grnd
2MW39	10:24	O	9.72	2.61 TOC to grnd
2MW40	10:35	O	8.60	2.55 TOC to grnd
2WP8	10:53	O	5.73	2.1 TOC to grnd
Finished	Site	2 at 10:51		
Start	Site	8 at 12:45		
8MW14	12:50	O	8.74	3.06 TOSC to grnd 1.93(-) TOC to TOSC
8MW15	12:47	O	10.14	2.24 TOC to grnd
8WP9	1:07	rain	7.59	0.58 TOC to grnd
8WP9D	1:10	rain	8.11	0.99 TOC to grnd
4WP11D	1:20	rain	10.02	2.48 TOC to grnd
8MW16	1:27	rain	7.61	2.71 TOC to grnd
8MW17	1:31	rain	8.25	2.47 TOC to grnd
GW8-C	1:41	rain	6.91	
GW8-A	1:52	rain	6.56	Well unlocked
GW8-B	1:59	rain	6.63	
8WP-10D	2:08	rain	7.11	2.27 TOSG to grnd 0.18 TOSC to TOC(+)
8WP-10	2:11	rain	5.80	0.71 TOC to grnd
				has not been grouted yet

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Well #	Time	Hv	TOC to water	Remarks
MW10	2:17	rain	5.61	no lock odor when opened
MW8	2:21	rain	6.78	
MW9	2:27	rain	6.49	no inner cap
4MW21	2:32	rain	7.30	2.79 TOC to grnd
8GMW42	2:42	rain	6.26	2.77 TOC to grnd west end of building
GW4D	2:48	rain	10.59	
4MW22	2:51	rain	9.49	2.58 TOC to grnd
GW4C	2:54	rain	10.95	
4MW23	2:59	rain	7.72	1.69 TOC to grnd
MW11	3:03	rain	7.83	
GW3A	3:33	rain	11.98	
GW3B	326	rain	9.82	
GW3C	3:30	rain	9.95	
GW3D	3:22	rain	6.40	
GW4B	3:39	rain	5.78	
GW4A	3:47	rain	5.00	
6GMW43	4:04	rain	13.13	0.45 TOC to grnd

Finished taking readings at 4:15

Jo Ann Sherwin 8/22/88

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~~24~~ 8/25/88

3:… Watching well development on MW14 & MW15 T. Cothon and Greg Ostling work during blue sky scattered clouds. They have been working on these for awhile

8/25/88

7:00 Clear blue ~~skys~~ skies, wind 15-25
8:00 Observe pumping of MW16 T. Cothon & Greg Ostling. They started pumping this well at 7:00 a
8:15 a. B McLeod came by and decided we should try flushing wells MW14, MW16 & MW17 with potable water to see if that speeded up the process of development. Stopped pumping MW16
9:15 Restarted pumping MW16
10:15 a Flushed & pumping MW14 & MW16, MW17
11:20 a. Finished pumping MW14

[illegible] Sherwin 8/25/88

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11:25 MW16 running clear. Stop pumping. Continue
11:30 MW17 – Start development
11:50 Lunch
12:45 Return to wells pump not working. out of gas
12:50 Start pumping
1:10 MW16 clear OK on development
1:15 Not entirely clear, but the MW17 well makes so little water that it is unlikely that it will get very much better. Hand pump used on this well
1:25 Quit, decon – go to next site
2:40 Start development of 4MW21 not so – forget barrels for water
2:50 Start well development
3:10 Start well development of 4MW24 with hand pump.

[illegible] Sherwin 8/25/88

61 8/26/88

8:00 Start work delayed due to dead battery in van

Start development of 4MW22 at 10:00 a

Start development of 4MW23 at 10:30 a. Electric pump at 3:20

Calibrated pH meter (J Hardeman did): Orion Research model SA 230 SN#2617 used fresh quantities of

pH 4.01 Lot No 8 2347
expiration date Apr 1989
Cole Parmer

pH 10.00 Lot No 8 2692
exp date Aug 1989
Cole Parmer

pH 7.00 Lot No 8 2601
exp date Jul 1989
Cole Parmer

John H also calibrated the

Jo Ann Sherwin 8/26/88

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Working well development c̄ Greg O

Conductivity Meter
Model 1484-10 Cole Parmer
S/N 7092005

Well # ~~4MW23~~	Time	Temp °C	pH	Conduc
4MW23	2:00	27.8	7.88	950
	4:30	26°	7.87	900

3MW27 Start development at 5:30 p (pumping)

Shut down, its not producing 5:35 p

6:00 p Attempt to flush well points along runway of site 8. Did not have all the fittings needed. Will do 1st thing in morning. Left job at 6:40 p

Jo Ann Sherwin 8/26/88

8/27/88

Clear, sunny, windy and chilly — in the 50's.

7:00a Calibrate the conductivity & pH meters with the same standards as used yesterday.

10:00a Flush 3MW25 & 3MW26
Start pumping.

3MW26 flushed back up through sandpack.

3MW25. pieces of the black plastic flush pipe seen in washings.

Need to get straight pipe looks like the inside of the screen is cutting up on the curved parts of the black pipe!

Get straight flush pipe
Jo Ann Sherwin 8/29/88

Temp Correction JS 9/1/88

and construct jets.

11:35 Flush 3MW25
11:40 ~~Flush~~ 3MW26 ~~25~~ JS ~~just to~~
Pump

Well #	Time	Temp°C	pH	Conduc
				750
4MW25	12:05	24°5	8.02	~~8.02~~
	12:35	26°7	8.06	813
	1:45	20°1	8.30	144
	3:40	Shut off pump		
4MW26	12:10	27.3	8.00	475
	12:40	26.7	7.85	550
	1:50	no water sample available		
	2:15	Shut off pump		

Will develop wells by hand pump & flushing

4MW27	3:40	12.3	8.11	225
"	4:55	13.4	6.97	250
"	5:30	14.5	7.31	300

Jo Ann Sherwin 8/29/88

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7:00	Start work, calibrate inst. overcast, on the cool side
8:00	Start development of MW27 Greg O

Well	time	pH	conduc	temp	TOC to grnd
MW27	8:30	6.31	275		2.83'
"	8:45	6.72	260		
	8:55	7.04	325		

9:00 Stop work on MW27 Its done Water a little milky but hardly any sediment at all

9:10 Move to MW26 & put in hand pump.

9:15 Start development of MW26

These readings taken w a pH meter that may be acting up, need to take 1 or 2 more readings

9:20 leave to get water truck

10:15 return - take one sample Mike (from Graves on the job)

Recalibrated pH meter One appears to malfunction.

Jo Ann Sherman 8/29/88

Readings# temp corrections 28 9/1/88 66

	Well#	time	pH	Conduc	temp °C
1	3 MW26	10:20	6.89	400	14.5
2	3 MW26	10:35	6.92	380	14.5
3	3 MW26	11:00	7.02	410	15.6
1	3 MW25	11:15	8.38	170	17.3 murky 1st sample after flush
4	3 MW26	11:25	7.50	310	13.4
2	3 MW25	11:35	8.18	225	13.4 muddy
5	3 MW26	11:55	7.62	300	13.4
3	3 MW25	12:00	8.36	325	13.4
6	3 MW26	12:15	7.30	340	14.5 clear
7	3 MW26	1:25	7.02	345	15.6*
4	3 MW25	1:30	8.18	400	17.3
5	3 MW25	2:35	8.03	400	13.4
6	3 MW25	2:50	8.11	200	15.6
7	3 MW25	2:55	8.02	425	14.5
8	3 MW25	3:25	8.18	250	15.6
9	3 MW25	3:40	8.14	300	15.6*
	3 MW27	3:50	7.83	375	13.4*
1	3 MW31	5:25	7.57	475	11.2
11	3 MW30	5:35	7.80	135	11.2
12	3 MW30	6:20	7.93	210	10.1

* means done, finished Jo Ann Sherman 8/29/88

10:30 left to get fitting Mike
& water truck left behind
10:40 flushed MW25 1 whole barrel
a lot of whitish - grayish particles
floating about
10:55 hand pump now assembled,
and pumping MW25
11:15 flushed MW26 used just
enough water to saturate
sandpack
12:20 flushed MW25
MW26 looks clear →
wait for pH's

1:35 3MW26 is done
2:00 Flush MW25
2:45 Flush MW25 after Reading # 5
TOC MW26 is 1.94' Total Steel casing is 2.0'
3:45 Finished development 3MW25
MW25 TOC = 2.78 TOSC = 3.0'
MW25 = Barrels 5
MW26 = Barrels = 2
3:45 Sample MW27
MW27 TOC = TOSC = Barrels = 1
4:20 Set up on wells MW30 & MW31
Jo-Ann Sherwin 8/29/88

Jo-Ann Sherwin 8/29/88

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Handpumps on both wells - good stream coming flush 30 at 4:45, hand pump clogged, need to clear it.

Flushed 31 at 5:05
Pumping good w hand pump.
Stopped pumping at 5:30
Decon & move hand pump to 30
Put electric pump in 31
6:10 Started pumping w electric pump in 31
6:15 Stopped pumping in 31 - something wrong w pump
6:30 Purged MW30 Used hand pump until 7:45. Quit for day

Jo-Ann Sherwin 8/29/88

8/30/88 70

Developing wells. Mike
G. Oathout Graves people: Tim
Start foggy, end blue sky high clouds
7:30 Set pump in MW 30 & start pumping

Calibrated pH & Conductivity meters
10:40 Finished with MW30
10:45 Set hand pump in MW31
10:55 1st sample MW31
TOC MW30 is 2.70' Barrels = 1½
TOC MW31 is 2.30' Barrels = 1
11:40 Finished with MW31
11:55 Put handpump into MW33 & start pumping
12:25 Put pump in MW34 & start hand pumping
1:45 Flushed MW34 - not producing any water
2:25 Short flush of MW34
4:10 Grouted B11 (next to MW30)
4:20 Finished MW34
5:00 Finished MW33
4:55 Start hand pump in MW32

J. Sherwin 8/30/88

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Temp corrections JS 9/1/88

Well #	Time	Temp	Condus	pH	Remarks
MW30	9:30	1~~0~~ 98	300	7.99	
MW30	10:10	1~~0~~1	350	7.90	clearing up
MW30	10:40	1~~0~~1	350	7.78	DONE
MW31	10:55	~~8~~ 9	600	7.55	
MW31	11:10	~~9~~ 10	675	7.42	
MW31	11:25	~~9~~ 10	~~750~~ 750	7.18	
MW31	11:35	~~8~~ 9	725	7.31	DONE
MW33	1:25	1~~0~~1	500	7.95	
MW33	1:50	~~8~~ 9	1025	7.97	
MW34	1:55	1~~2~~ 3	135	9.15	1st after flushing
MW33	2:15	~~8~~ 9	525	8.16	
MW34	2:20	1~~1~~ 2	260	8.41	
MW34	2:45	1~~3~~ 4	225	8.31	
MW33	2:50	~~8~~ 9	1025	7.89	getting clear
MW34	3:15	1~~2~~ 3	400	8.03	
MW33	3:20	~~8~~ 9	775	7.81	
MW34	3:45	1~~1~~ 2	525	7.92	getting clear
MW33	3:50	~~8~~ 9	1275	7.80	clearing up
MW34	4:15	1~~1~~ 2	525	7.88	DONE
MW33	4:20	~~9~~ 10	1200	7.77	
MW33	4:55	~~8~~ 9	1275	8.01	DONE
MW32	5:05	1~~0~~1	1375	7.78	very muddy 1st sample
MW32	5:30	~~9~~ 10	1500	7.52	
MW28	5:35	1~~0~~1	180	8.50	muddy 1st sample

J. Sherwin 8/30/88

Temp corrections JS 9/1/88

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5:30 Start handpump in MW28

5:30 Flushed & pumping MW29

— USED curved black pipe — found to have black plastic cuttings in the well (electric pump)

~~6:10~~

640 Stopped pumping MW32 & MW28

6:45 Stopped electric pump in MW29

Quit for day

Well #	Time	Temp	Conduc	PH	remarks
MW32	5:55	~~8~~ 9	1550	7.61	starting to clear
MW28	6:05	1~~0~~1	275	8.40	starting to clear
MW29	6:10	1~~4~~ 5	450	7.69	1st sample
MW29	6:20	1~~4~~ 5	550	7.52	Big water producer
MW32	6:25	~~8~~ 9	1560	7.26	clearing up
MW28	6:30	~~9~~ 10	375	8.20	—
MW29	6:40	1~~4~~ 5	600	7.55	clearing up

Jo-Ann Sherwin 8/30/88

73 8/31/88 Temp corrections JS 9/1/88

Overcast day Mike & Tim & Greg Oothout

Well#	Time	Temp	Conduct	pH	Remarks
MW32	8:00	~~8~~9	1800	6.95	clear
MW28	8:10	~~9~~10	450	7.80	clearing
MW32	8.15	~~8~~9	1800	7.24	DONE
MW29	8:30	145	700	7.29	clearing
MW28	8:35	101	475	8.10	
MW29	8:50	145	725	7.33	shut down & remove black pipe
MW28	9:05	101	500	8.05	
MW28	9:30	101	510	8.03	clearing good
MW35	9:35	134	260	7.76	1st sample
MW28	10:00	101	510	8.08	DONE fairly clear
MW35	10:05	134	300	7.62	
MW35	10:50	123	375	7.50	well to be flushed.
MW35	12:25	145	380	7.55	very muddy
MW29	1:45	201	775	7.34	cleaning up high temp probably due electric motor
MW35	2:00	145	400	7.43	clearing up
MW29	2:15	186	775	7.31	still a little cloudy
MW29	2:25	145	760	7.26	perfectly clear DONE
MW35	2:30	145	450	7.38	clearing up
BGMW42	2:50	134	250	7.61	fairly clear

JoAnn Sherwin 8/31/88

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7:00 start pumping MW32 & MW28
7:45 calibrated pH & conduc meters
8:15 Finished MW32 1 Barrel
9:00 Shut down MW29 needs to be flushed to remove any plastic & 1 or 2 more readings taken
9:10 Start hand pump in MW35
10:00 Finished MW28
TOC MW29 = 2.5' total length protect case
10:55 Flush MW35 to clean out upper part of screen
11:10 Flushed MW35
11:30 Flushed MW29 to remove plastic etc.
12:40 Restart electric pump on MW29
1:00 Move to BGMW42
1:30 Start pumping BGMW42 w/ hand pump - will pump dry, then flush
1:55 Stop MW29 to get new barrel for water
2:05 ~~Stop MW29~~ Start pumping MW29
2:30 Stop pumping MW29

JoAnn Sherwin 8/31/88

75 Temp Corrections JS 9/1/88

Well#	Time	Temp	Cond	pH	Remarks
MW42	3:20	134	275	7.65	
MW35	~~3~~ 3:45	156	550	7.49	
MW42	5:15	134	185	7.62	
MW42	5:20	123	210	7.56	
MW42	6:40	173	250	7.59	a little bit cloudy JS

Jo Ann Sherwin 9/1/88

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3:30	Gently flushed out MW42 twice
3:45	Stopped pumping MW35 - area closed, will need about an hour in the morning
5:55	Started pumping w handpump in BGMW43
6:45	Stopped pumping MW42
6:40	Stopped pumping MW43

Jo Ann Sherwin 9/1/88

77 9/1/31 Temp correction JS 9/1/88

	Well #	Time	Temp	Condu.	pH	Remarks
6	MW 42	7:35	123	350	7.77	
7	MW 42	7:55	123	350	7.57	
	MW 43	8:20	9.10	1125	7.05	
	MW 43	8:40	89	1075	6.91	
8	MW 35	9:00	145	128	7.47	
5	MW 43	9:35	101	1150	7.10	
9	MW 35	10:30	134	400	7.45	cloudy
10	MW 35	10:45	134	400	7.48	clearing
	MW 43	11:00	112	JS corrected 4875	7.10	still muddy
11	MW 35	11:10	145	425 ~~587.5~~ JS	7.31 ~~7.18~~	a little cloudy
12	MW 35	11:30	145	400	7.32	DONE still cloudy - best we could do on this one
	—	—	—	—	—	
1	MW 21	12:10	134	475	6.90	a little cloudy
2	MW 21	1:15	123	675	7.22	cloudy
	MW 43	1:25	101	1125	6.89	muddy
3	MW 21	1:45	134	725	7.05	
1	MW 41	3:05	136	185	7.10	1st sample after flushing
4	MW 21	3:00	145	775	7.10	
	MW 43	3:45	101	1150	7.07	still coughing up mud
	MW 43	4:00	101	1160	6.90	
5	MW 21	4:10	123	750	7.05	
2	MW 41	4:25	123	180	7.10	

Jo-Ann Sherwin 9/1/88

9/1/88 78

7:00a Start Work: Mike Roddy, Bill & John Anderson to do caps & welding

Rainy day but not too cold

Well development - Mike Terry, Greg O., myself, Calibrated inst. 7:30

7:15 Start pumping BG MW 42

7:20 Start pumping BG MW 43

7:55 Stop pumping MW 42

8:20 Start sampling MW 43

9:00 Start pumping MW 35

9:10 Stop pumping MW 35

9:40 Flush MW 43

10:30 Start pumping MW 35

11:35 Stop pumping MW 35

12:05 MW 21 - check to see if clarity o.k. Not really clear & black plastic found.

12:10 lunch

1:05 Pump MW 21 muddy

1:45 - 1:15 No pumping on MW 43

1:30 MW 43 is starting to make water & appears to be improving

2:45 Set up on MW 41 to handpump

Jo-Ann Sherwin 9/1/88

Well =	Time	Temp	Conduc	pH	Remarks
3 MW4	4:45	14	180	6.68	
4 MW41	4:55	14	225	6.64	clearing up
5 MW41	5:10	12	235	6.64	DONE
6 MW21	5:45	17	775	7.14	DONE
8 MW43	6:00	13	1175	6.90	DONE

↳ Still muddy water coming up in 2nd pump of hand pump - only makes a quart of water every 15 min or so. Measurements taken in clean sample which is clear at end of pump.

Jo Ann Sherwin 9/1/88

not much water all mud
flushed it Starting to look good
3:00 Started pumping MW21
4:45 New mercury thermometers
All temp readings need to be
corrected by 1°C Done
5:15 MW 41 Does not make a lot
of water, & its a little cloudy,
but is stable. Stop develop-
6:00 Stop pumping MW43
6:00 MW40 Set up, flushing pump
6:25 Quit pumping
6:30 Quit for day

Jo Ann Sherwin 9/1/88

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9/2/88

Well#	Time	Temp	Conduc	pH	Remarks
MW22	9:40	9	825	21+	
MW40	10:35	15	130	7.8	just flushed
MW22	10:55	10	1175	7.5	clearing up
MW23	11:05	11	1125	7.6	clearing up
MW22	11:15	10	1000	7.62	
MW23	11:20	10	1140	7.64	
MW22	11:25	9	1050	7.55	
MW23	11:35	10	1150	7.57	DONE
MW40	12:15	17	185	7.86	
MW40	12:50	16	200	7.80	
MW22	1:10	10	1200	7.42	
MW24	1:20	15	475	8.53	
MW24	1:30	17	475	8.53	perfectly clear DONE
		electric pump on this well			
MW22	1:35	10	1200	7.45	
MW40	2:50	16	210	7.90	
MW15	3.05	18	360	7.02	clear
MW22	3.10	18	1225	7.20	clear enough

Jo Ann Sherwin 9/2/88

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7:00a Start work drizzly in the 70's. Mike & Tim from Graves decomming.
Mike Roddy to do detail work on wells.
7:30 Start pumping MW40
8:00 Start pumping MW23 — looks like it had never been touched. No barrels left at site. Very muddy
9:00 Start pumping MW23
Calibrated instruments
9:30 Stopped pumping MW23
10:00 Flushed MW40
10:
11:35 Stopped pumping MW23
12:55 Started pumping MW24
3:00 Stopped pumping MW22 MW40
Pumped some on MW15 — perhaps ½ hr enough to clear its clear. MW4 is still quite muddy & may need further development. The well doesn't produce enough water to flush the well

Jo Ann Sherwin 9/2/88

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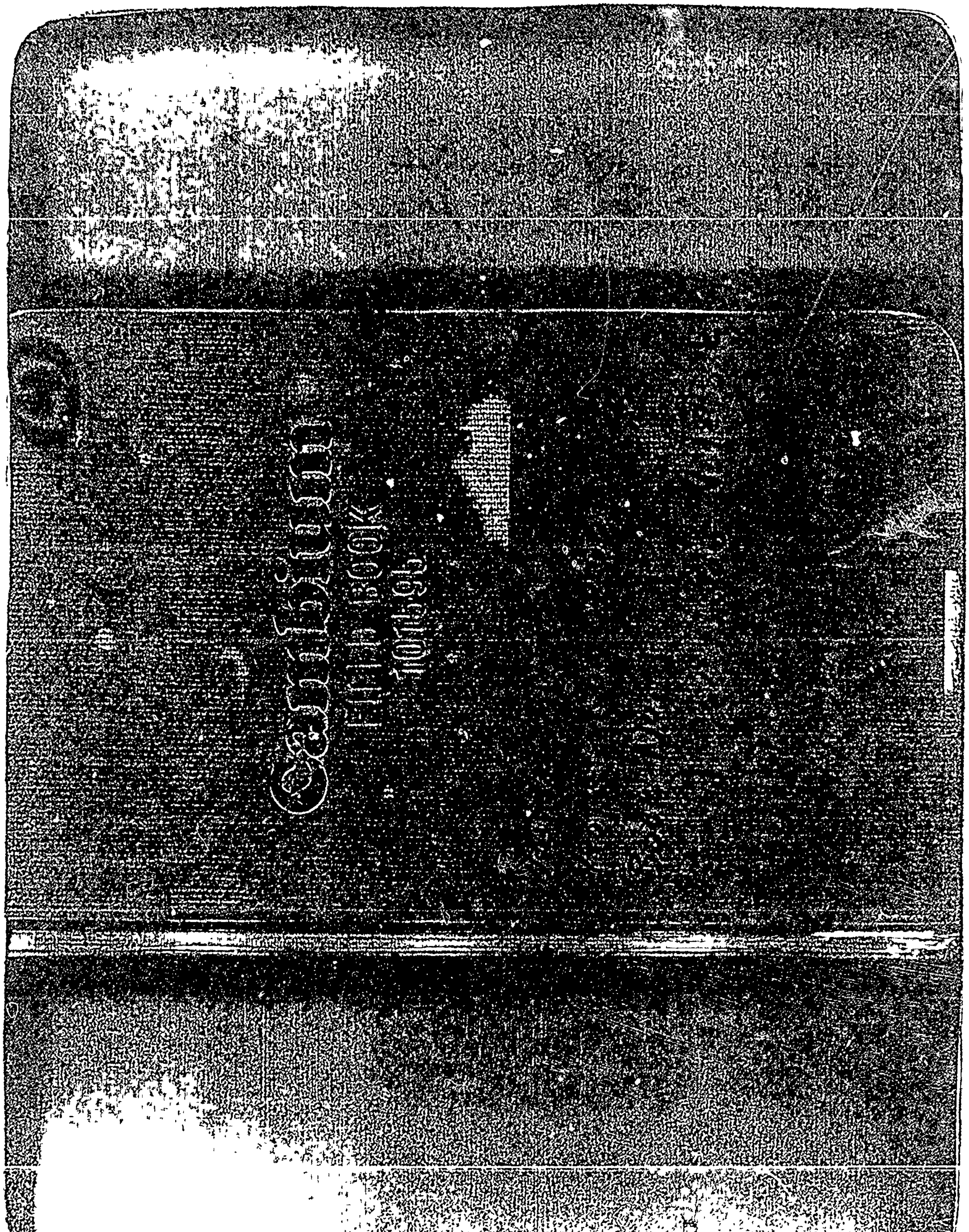
Q.2.4 Notebook 4, Field Technician

This notebook contains decontamination records, calibration records for the HNU meters, records of photographs taken, records of shallow soil sample collection at Site 3 and the third round of water level measurements. Forty nine pages of this book were used, the first entry is 27 July 1988 and the last entry is 27 September 1988. Most entries were signed by Kimberly L. Davis. A few pages are signed by Jo-Ann Sherwin.


FIELD BOOK

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Projects

Projects (continued)

Nar

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[signature] 7-27-88

2

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624-4349

7-27-88

3

Emergency Contacts

Base Main Gate Security 723-7280
Fire Department 723-7235
Poison Control 1-800-332-3073

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Hospital - St. Lukes Hospital of Duluth
Address: 915 East 1st St., Duluth, MN
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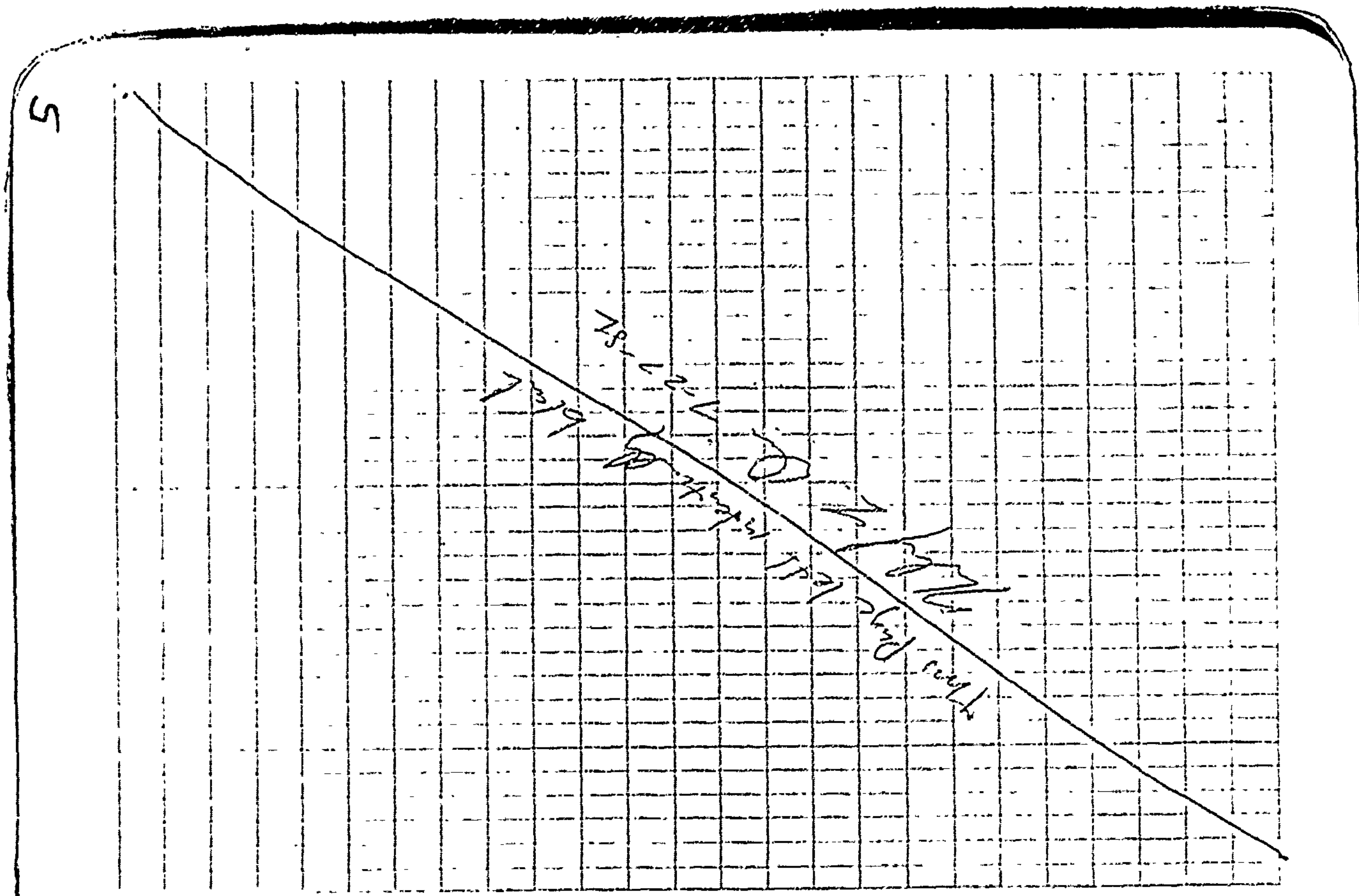
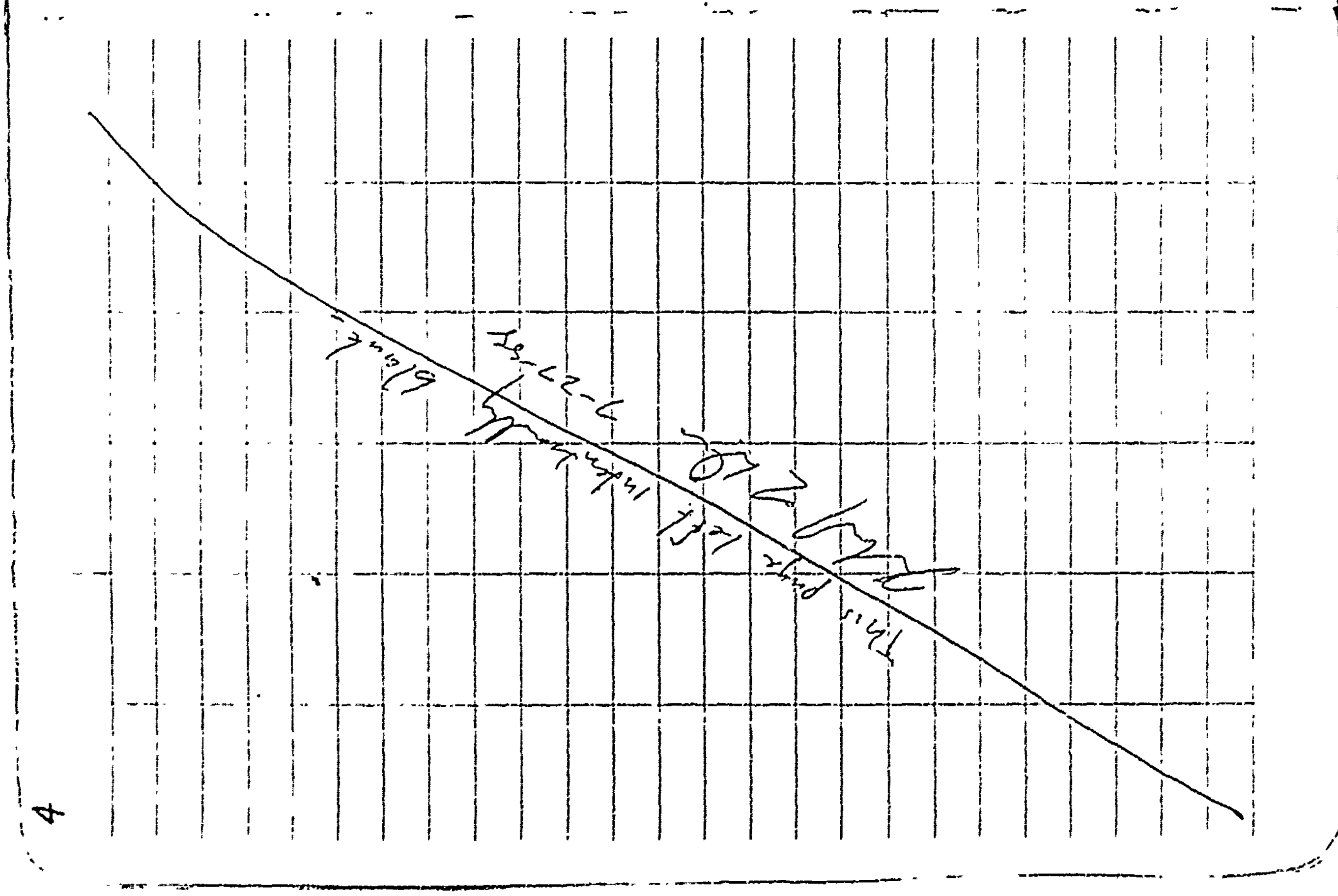
7-27-88





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7-27-85

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7-27-85

8

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Kimberly J. Davis 7-27-88

9

7-27-88

1415: Completed deconning water level indicator as per RI Work Plan (see "Decontamination Procedures" pp. 6-9 through 6-11, specifically, Section 6.6.4.2). Mr. Dennis Forsberg pointed out that a "paper trail" must exist for each piece of equipment, thus mandating the initiation of keeping this field notebook. Serial #: 10035, Slope Indicator Co. IMPORTANT NOTE: Decon procedure deviates from work plan in the elimination of the disposable soap-impregnated cloth step; a methanol rinse and a HPLC water rinse are the two steps employed.

1520: Arrival at Site 2. Prepared to measure water levels.
1535: Briefly went back to office to retrieve teflon squirt bottles. Left Joanne at site.
1600: Arrival back at Site 2. John has joined Joanne. They are busy scoping out existing wells.
1630: Began surveying existing monitoring wells on Site 2 with Joanne due to inaccuracies noted on map.
1820: Completed surveying.

Kimberly J. Davis 7-27-88

7-28-88

0730: Arrived at base. Organized field equipment.

0900: Headed out to Site 2 with Jo Ann Sherwin to take water level measurements. (See Jo Ann Sherwin's notebook for details.) Water level indicator already decontaminated (see 7-27-88 notes, previous page).

1300: Completed Site 2 water level measurements. Went to lunch @ 1330.

1515: Headed out to Site 3 to take water level measurements with Jo Ann Sherwin. First, recalibrated ~~water level indicator~~ HNU to ~~72~~ 10.2. (Followed procedure in HNU manual, Dec '85, page 8-5.) detector # 500791 # 500184 probe

1730: Started Site 4.

1830: Water level indicator batteries wore out. Went back to office. Picked up batteries on the way back to motel.

Note: See Jo-Ann Sherwin's notebook for all water levels and times.

Kimberly Z Dow 7-28-88

7-29-88

0645: Arrived at base. Calibrated HNU to 23; followed procedure on page 8-5 of HNU manual, Dec. '85. Detector # 500791, probe # 50018. Jo-Ann Sherwin took this HNU to measure headspace of wells that she is measuring water levels on. (See J. Sherwin's notebook for further info on this activity.)

0845: Recalibrated HNU, Detector # 164716 Probe # 501284 to ~~23~~ 9.5 on span setting. Followed procedure on p. 8-5 of manual Dec '85, HNU.

0920: Jo Ann returned from buying more supplies. I joined her to begin measuring water levels at Site ~~3~~ 4. (see her notebook).

1130: Completed water level measurements. Picked up supplies and met John Hardeman + Peter Riemersma at Site 2 (with drill crew). Rest of afternoon: I assisted J. Hardeman & P. Riemersma as they collected soil samples from Borehole #1 at Site 2 (see P. Riemersma's notebook for details.)

1700: Quit drilling due to approaching thunderstorm. Went back to office until 1800.

Kimberly Z Dow 7-29-88

7-30-88

0645: Arrived at office.

0700: Went to Site 2 with P. Riemersma & J. Hardeman to meet drill crew. Continued with BH-1 rest of A.M. (See P. Riemersma's notebook for details.) I assisted in sample preparation.

1200: LUNCH (See P. Riemersma's notebook for decon of wash pails.)

1300: Continued, started BH-2 in the FTA vicinity as well.

1610: Took samples to Fed Ex (closes at 1700 today).

1700: Went back to office

1730: Left.

Kimberly L Davis 7-30-88

8-1-88

0605: Arrived at office. Ate breakfast, took notes, recharged HNU #506791-50018, and deconned wash pails as follows:

(1) Scrubbed w/ Alconox
(2) Rinse w/ potable water
(3) Sprayed w/ methanol
(4) D.I. water final rinse

0710: Headed out to BH-2, site 2.

0800: Completed BH-2. (See details in Pete Riemersma's field book.) I deconned wash pails using procedure above, discarding rinse water in the 55 gallon drums designated to store waste water. Completed decon at 0830.

0845: Drove to next site, a shallow well point location on Site 2. Brought buckets with fresh potable water with me. Waited on rest of driller until 0945 then left to pick up JoAnn Sherwin at airport.

1100: Returned to site briefly, then went back to office for lunch.

1210: Began assisting John Anderson with decon of augers, extensions, sleeves, etc. He had previously liquinoxed them yesterday.

Kimberly L Davis 8-1-88

14

Today he was steaming them again. Next, I applied a methanol rinse with the stainless-steel sprayer. Then, I applied a final rinse of DI water.

1400: Three guys from Woodward-Clyde approached me. Wanted to know if we had any extra methanol. I told them "no." (I used last gallon the past hour.) Asked if we owned all supplies in office ("yes, except small box of tyvecs, etc on table") Wanted to know if we could share office. I suggested to seek out other space.

1410: Continued applying D.I. rinse to drilling parts.

1425: Finished deconning. John Anderson is wrapping parts in vinyl.

Rest of afternoon: sat around and watched drillers put in well point.

1700: Left.

Kimberly L. Davis 8-1-88

15

8-2-88

0605: Arrived at office. Deconned work pails as outlined on page 13 lines 4-7 of this field notebook.

0715: Headed out to survey in monitoring well locations per Bob McLeod's instructions. These will be drawn in on aerial photos Bob brought.

See Jo Ann Sherwin's notebook for details of survey.

1025: Headed out to Site 3 to continue surveying.

1120: Completed Site 3. Went to Site 8, to continue surveying.

1230: Completed Site 8. Went to eat lunch

~1500: Went to Site 4 to continue surveying. See Jo Ann Sherwin's notebook for details

1700: Completed site 4. Went to office

1730: Left

Kimberly L. Davis 8-2-88

8-3-88

0630: Arrived. Prepared to go to Site 2 with Peter Riemersma, John Hardeman & Bob McLeod.

0710: Change in plans per John Hardeman's instructions. Stayed at office with Jo Ann. Worked on plotting up ~~new~~ existing well ~~&~~ locations, KCP rest of morning.

Afternoon: Watched Rotosonic drilling operation.

1730: Left.

Kimberly Z. [illegible] 8-3-88

8-4-88

0630: Arrived.

0800-1230: Observed random digging in supposed vincinity of Site 2's fire training area #1.

Afternoon: Assisted in packaging of soil samples for MW-12, Site 2. Four samples total. See Peter Riemersma's notebook for details. Note: A small error was noted in sample bottle labelling; Peter Riemersma left the "B" out of "DANGB-MW12-SS1" numbers. Therefore, I labelled the chain of custody without the "B" as well, which deviated from the RI Work Plan's labelling system outlined on page

1800: Left.

Kimberly Z. [illegible] 8-4-88

8-5-88

0630: Arrived. Calibrated HNU, detector #164716, probe #501288. No change in span setting. Used isobutylene batch #9488-061588, lot #12 per calibration instructions in HNU manual, p. 8-5, Dec. '85.

0715-0847 Took 3 samples from MW-13 (see Pete Riemersma's field book for details). Assisted in sample packaging.

0925: Completed sample packaging for MW-13.

Rest of morning: reviewed Dames & Moore report, ran errands.

1300-1600: Drilled MW-18, MW-20 on Site 8. These will be abandoned as boreholes since ~~the~~ bedrock was encountered at same depth as existing wells they were to complement. (See P. Riemersma's notebook for details.)

1600-1730: Prepared samples for Fed Ex.

1800: Left

[signature] 8-5-88

8-6-88

0640: Arrived. Working with P. Riemersma & J. Sherwin.

0740: Calibrated HNU 164716, probe 501288 to 326 using isobutylene, batch #9488-061588, lot #12 per calibration instructions in HNU manual, p. 8-5, Dec. '85.

0800: Assisted in sample preparation on Site 8. Also am taking HNU readings. This is Well Point #10, so no soil samples.

Well Point #10

Depth	HNU reading
0-5'	0 ppm
5-10'	0 ppm
10-15'	0 ppm

(Further readings recorded on P. Riemersma's field log)

Began a photographic record at this point of the RI.

- Roll 1, picture #20: Site 8
  top: SS-1, 0-5' (Well Point 10)
  bottom: SS-2, 5-10' (left to right)
- Roll 1, picture #21, Site 8
  Well point #10 drilling operation with drillers John Anderson and Jim H.
- Roll 1, picture #22, Site 8
  Well point 10, left, SS-3, 10-~~15~~' bottom→top KLD 8-6-88

[signature] 8-6-88

- right: SS-3, 11-15' (bottom → top)
- Roll 1, picture #23, Site 8
  WP#10, SS-4, 15-20' (left → right)
- Roll 1, picture #24, Site 8
  WP #10, SS-3, 10-15'
  10-11' top, 11-15' bottom (left → right)
- Roll 1, picture #25, Site 8
  WP #10, SS-1 (top) SS-2 (bottom)
  SS-1 = 0-5', SS-2 = 5-10' (L → R)
- Roll 1, picture #26, Site 8
  WP #10, SS-5, 20-22.5' (left → right)
  time: 0919
- Roll 1, picture #27, Site 8
  WP #10, SS-6, 22.5-27.5' (left-right)
  time: 0942
- Roll 1, picture #28, Site 8
  WP #10, SS-6, 27.5-32' (left-right)
  time: 0952
- Roll 1, picture #29, Site 8
  WP #10, SS-7, 32-35' (left → right)
  time: 1021

1050: After testing the 30-40.5' sample, obtained erratic readings on HNU, Went back to office to check calibration. Determined that moisture in sample caused the reading, which steadily

Kimberly L. Dow 8-6-88

increased from 0-50 ppm over 5-10 seconds. Calibration was still O.K.

- Roll #1, picture #30, Site 8
  WP# 10, SS-?, 35-40.5' (L → R)
  time: 1114
- Roll #1, picture #31-32, Site 8
  WP #10, SS-?: 40.5-45' (L → R)
  time ~~1025~~ 1125
- Roll #1, picture #33, Site 8
  WP #10, SS-?: 45-47' (L → R)
  time: 1141

NOTE: At all times through pages 19-21, WP#10 should be WP #10 D.

- Roll #1, picture #34, Site 8
  WP#10D - building well point
  time: 1345
- Roll #2, picture #1, Site 8
  WP #10D - building well point.
- Roll #2, picture #2 Site 8
  WP#10S - 0-5' time: 1530
- Roll #2, picture #3, Site 8
  WP #10S 5-10' time: 1530

(See Pete Riemersma's notebook for details of WP #10S and WP #10D.)

Kimberly L. Dow 8-6-88

- Roll #2, picture #5, Site 8
  WP #10S, 10-15' time: 1540
  Note different lithologies.
- Roll #2, picture #6, Site 8
  WP #10S, 15-20' time: 1558
- Roll #2, pictures #7, 8, 9, Site 2
  "Hazardous Waste" dump site for 55 gallon drums which were dug up by an unidentified front end loader around Site 2, near the road on Friday, 8-5-88. Time: ≃1645.
  These pictures were taken after Jo Ann Sherman & I measured distance from a well to a borehole on Site 2 (see J. Sherman's notebook for details).

1700: Left for day.

Kimberly L. Dean 8-6-88

8-7-88 SUNDAY - NO WORK TODAY

8-8-88

0680: Arrival. Calibrated HNU #500791 detector #500018 with isobutylene (94.7 ppm) supplied by Liquid Carbonic, batch #9488-061588, lot #12, per instructions in HNU manual, p. 8-5, Dec. '85.

0800: Prepared to drill south of road on Site 8, a deep + shallow monitoring well pair. I will be assisting in soil sample collection.

- Roll 2, Picture #14, Site 8
  MW-14, 0-5' left, 5-10' right
  bottom → top time: 0830
  0 → 5
  5 → 10
- Roll 2, Picture #15, Site 8
  MW-14 drilling operation
  John, Jeff, + Bill time: 0840
- Roll 2, Picture #16, Site 8
  MW-14, 10-15' (bottom → top) time: 0900

NOTE: Took duplicate of water table sample, SS-3.

1015: Talked to Bill Hayden on telephone. He said that DANG88-MW20-SS1 arrived broken in California - L L Amber. Also, DANG88-MW20-SS4 was not on chain-of-custody sheet as

Kimberly L. Dean 8-8-88

It should have been. This chain-of-custody was dated 8-5-88.

- Roll 2, picture # 17, Site 8, MW 14 SS 3, SS 4, SS-5, right (bottom) half
  SS-3 and SS-4 are side by side due to poor recovery for a total of 15-25'
  SS-5 is underneath; this picture shows 27'-30'. time: 1106
- Roll 2, picture # 18, Site 8, MW-14 SS-3, SS-4, SS-5, left (top) half.
  SS-3 and SS-4 are side by side due to poor recovery for a total of 15-25'
  SS-5 is underneath; this picture shows 25-27'
  time: 1100
- Roll 2, picture # 19, Site 8, MW-14 SS-5 continuation, 30-33.5' (L→R) time: 1106.
- Roll 2, picture # 20, Site 8, MW-14 33.5-35' time: 1127. (L→R)
- Roll 2, picture # 21, Site 8, MW-14 35-39' (L→R) time: 1235
- Roll 2, picture # 22, Site 8, MW-14 39-44' (L→R), bedrock time: 1235

1240. Broke for lunch. Rest of afternoon, read over reports, ran errands. Left at 1700.

Kimberly L. Davis 8-9-88

8-9-88

0645: Arrived.

0715: Decontaminated three stainless steel wash pails as described on page 13, lines 4-7 of this field notebook.

0800: Went to Site 2 to assist Jo Ann Sherwin in surveying in ≃30 locations where front end loader dug in supposed vicinity of FT-1. See J. Sherwin's notebook for details.

1150: Completed "borehole" locations for the AM. Finished all

1200-1330: Ran errands, ate lunch

1345: Went to watch decontamination of drill casings + core pipes.
First, truck was steam-cleaned. Then pipe which had been previously decontaminated was loaded on. I witnessed the decontamination of (2) five foot sections, (2) 2 foot sections (7) 10 foot sections of outer casing, (1) 10 ft section of inner core casing. Procedure:

(1) Spray w/ Alconox via steam cleaner
(2) Spray w/ potable H_2O via steam cleaner
(3) Spray w/ methanol with pesticide sprayer (stainless steel)
(4) Spray w/ DI H_2O " "

Kimberly L. Davis 8-9-88

1530: Completed decon of pipes above, plus (3) 5 ft. outer casing sections. Placed on plastic. Bill moved all clean pipe onto plastic placed on a pallet on ground, and covered. Next, approximately 80 feet more of pipe was deconned in the same manner, as outlined on the last 4 lines on page 25.

1630: Completed this set of pipes; Bill placed these on plastic with other pipes.

1700: Left

Richard Z. Dow 8-9-88

8-10-88

0630: Arrived. Calibrated HNU # 500791, detector, probe #500018 with isobutylene (94.7 ppm) supplied by Liquid Carbonic, batch # 9488-061588, lot #12, per instructions in HNU manual, p. 8-5, Dec. '88.

0800: Assisted in sample preparation from MW-19 and MW-16. MW-19 was not completed as a monitoring well since bedrock was encountered at the same depth as the existing "shallow" well it was to complement. See P. Riemersma's notebook for details.

- Roll #3, picture 1, Site 8 MW-16 drilling operation. John Andersen time 1105
- Roll #3, pictures 2, 3. Site 8 Scenery around MW-18

1200: Broke for lunch.

1300: Returned to MW-16. I continued to assist P. Riemersma as above.

- Roll 3, picture 4, Site 8 MW 16, 0-5', 5-7.5', 7.5-10' arranged from top to bottom.
- Roll 3, picture 5, Site 8 MW-16, 10-15', 16-20' top to bottom 15-16' not in picture, but is the same

Richard Z. Dow 8-10-88

a) 16-20'.

- Roll 3, picture 6, Site 8
MW-16 - 20-21¾', 21¾-23½', 23½-25',
arranged from top to bottom.

- Roll 3, picture 7, Site 8
MW-16: 25-30', boulder.

- Roll 3, picture 8, Site 8
MW-16. Bill, John Herdman, John Anderson
John is welding a broken piece; a common
method for repairing items thus far.

1400: Went to buy Vermiculite for packing.

1445-1630: Prepared samples, Fed Exed
out.

1645: Began plotting up points on Site 2.

1820: Left.

Kimberly L. Davis 8-10-88

8-11-88

0630: Arrived. Calibrated HNU detector # 500791
probe # 500018 with isobutylene gas supplied
by Liquid Carbonic, batch #9488-061588, lot #12,
per instructions in HNU manual, p 8-5, Dec '85.
Reset span slightly to 3.20.

0900: Began WP-9D. I assisted Pete
Riemersma in sample collection (for lithology
only), photograph and general errands.
See P. Riemersma's notebook for details.

- Roll 3, picture 9, Site 8
WP-9D, 0-6' (L→R) Note that
picture caption indicates "0-5'" this
is not correct. time: 0958

- Roll 3, picture 10, Site 8
WP-9D, 6-8.5' (L→R) Note that
picture caption indicates "5-7.5'":
This is not correct. Time: 0959

- Roll 3, picture 11, Site 8
WP-9D, 8.5-11' (L→R) Time: 1001

- Roll 3, picture 12, Site 8
WP-9D, 11-14' (L→R) Time 1014

- Roll 3, picture 13, Site 8
WP-9D, 14-14', (L→R) Time 1015

Kimberly L. Davis 8-11-88

- Roll 3, picture 14, Site 8
  WP-9D, 18-19½' (L→R), Time: 1031
- Roll 3, picture 14, Site 8
  WP-9D, 19½→23' (L→R) Time: 1032
- Roll 3, picture 15, Site 8
  WP-9D, 23-26' L→R, Time 1033
- Roll 3, picture 17, Site 8
  WP-9D, 26-28' L→R, Time 1057
- Roll 3, picture 18, Site 8
  WP-9D, 28-31' L→R, Time 1105
- Roll 3, picture 19, Site 8
  WP-9D 31-36' L→R, Time 1106
- Roll 3, picture 20, Site 8
  WP-9D, 36-38' (no caption), Peter R. is holding cross section of core, which was too firm to crumble, Time 1113
  This cross section also is representative of what was contained in 38-41'.
- Roll 3, picture ~~21~~, Site 8
  WP-9D, ~~38~~ ~~40~~ 40 - 43.5', L→R, Time: 1150
- Roll 3, picture 22, Site 8
  WP-9D, 43.5-46', Time: 1151 (L→R)

1230: Broke for lunch. Placed phone calls, read QA/QC comments, and worked w/ new computer.

[signature] 8-11-88

1445: Calibrated HNU detector #164716 probe # 501288 using isobutylene gas supplied by Liquid Carbonic (94.7 ppm) batch # 9488-061588 lot # 12 per instructions in HNU manual p. 8-5, Dec '85. Adjusted span to 3.61. Prepared to go to Site 8 with Jo Ann Sherwin and Mike Roddy to test 24 borehole locations from 1.5' 2 weeks in July. I assisted Mike R. and J. Sherwin for 30 minutes then I went to assist Bill in sanding the paint off of the stainless steel monitoring well pipes.

1715: Went back to office; prepared to leave.

1800: Left.

[signature] 8-11-88

8-12-88

0635: Arrived. Heavy rain.

0800: Rain subsided. Drillers began deconning Rotasonic drill rig, since last holes were punched yesterday at Site 8. Following deconning, drilling will re-commence at Site 2.

0945: Completed decon of the drilling rig.
Procedure: (1), Steam clean with potable water;
(2), Steam clean with liquinox;
(3), Steam clear with potable water.

Began steam cleaning well casing and core pipes. 90 ft. casing and 50 ft. core pipe on rack now.

1030: Completed deconning well pipes described directly above. Procedure described on last four lines of page 25.

1045: Calibrated HNU detector #164716 probe # 501288 with 94.7 ppm isobutylene supplied by Liquid Carbonic, batch # 9488-061588 lot # 12 per instructions in HNU manual, p. 8-5, Dec. '85. No adjustment in span. This HNU will be used later today during drilling operations at Site 2.

1100-1200: LUNCH

Kimberly L. Davis 8-12-88

1200-1345: Reverend in downtown Duluth.

1400: Went to Site 2. Delay in drilling due to missing connection.

1500: Began drilling a borehole which may be constructed into a monitoring well at FT-1 location on Site 2. I assisted Mike Roddy and Peter Ricmersma in gathering analytical samples.

1700: Terminated drilling at this borehole due to large boulder. Will discard the one surface sample pulled from this hole. Decided to drill new hole tomorrow in different location.

1730: Left.

Kimberly L. Davis 8-12-88

8-13-88
0645: Arrival. Peter calibrated HNU.
0715: Went to Site 2. Began drilling new borehole near one yesterday which was abandoned. I will be assisting in sample preparation. This is MW-38.
0800: Postponed drilling due to lightning directly overhead.
0845: Lightning subsided. Quickly gathered three samples in the drizzle. I prepared samples for shipment while Peter Riemersma, Mike Roddy, John Hardemen, John Andersen and Bill — began building well.
1045: Lightning occurred directly overhead again.
1130: I left site to go to office, others followed.
1300: Lunch, then left for day.

8-13-88

8-15-88
0640 Arrival. Peter Riemersma calibrated HNU. Some difficulty in getting a probe to work properly.
0725: Went back out to MW-38, Site 2 to complete building well. Missing stainless steel clamps for well screen stabilizers.
0915: Began building well.
— Roll #4 picture 11, Site 2 MW-38. General activity surrounding building of well. John Andersen, John Hardemen, Bill —, and Jeff Aus. Time: 0920
0945: I went to run errands.
1100: Returned. Finished well, rig was moving to MW-37 location
1200-1300 — LUNCH
1300: I began assisting P. Riemersma in soil sample collection + packaging on MW-37.
1415: Completed taping soil samples. Took one duplicate — SS-5 on this well.
— Roll #4, picture 12, Site 2
MW-37 cores, L→R: 0-5', Far left; 5-16', next 2 middle cores, 16-18.5', far right core. (Top of hole is bottom, Bottom of hole is top of picture for each core.)
Time: 1425

8-15-88

1430-1545. Built MW-37

1600: Moved rig to MW-39 Site 2. I
Continued to assist in sample collection.

1720: Completed packaging of samples. Went to
Fed Ex.

1820: Left for home.

[illegible] 8-15-88

8-16-88

0635: Arrival. Decommd Stainless steel buckets
as per procedure listed on page 13,
lines 4-7. Ran errands.

0930: Started drilling MW-40, Site 2.
I assisted Pete Riemenschneider in soil
sample collection and packaging.

1145-1215: LUNCH

1215: Drillers begin installing well screen:
John Anderson, John Hardeman & Mike —.
- Roll #4, Pictures 14, 15, Site 2
MW-40 sandpacking: John A., Pete R,
Mike.
- Roll #4, Picture 16, Site 2
MW-40 borings 0-15'. Final core
is not in picture, which contains some
bedrock fragments.

1300: Begin moving towards well points 7S & 7D
on Site 2. Difficulty in access.

1400: I left site 2 to begin packaging
soil samples for Fed Ex.

1515: Called Bill Haydon; he called earlier
desiring total # of samples taken thus far.
Told him ≈ 59 samples, 8 dups., rough estimate.

1530-1730: Packaged (3) MW-40 samples.

[illegible] 8-16-88

(12) site 3 surface soil samples taken by J. Sherwin and M. Radaly. (No dups)

1230: Went to Red Ex.

1800: Went out to site 2, WP-7D site to check on progress. Appeared to be finishing up, returned to office w/ J. Sherwin + M. Radaly. Shortly after, ≈ 1830, left. J. Sherwin + I stopped for supplies on the way home.

[signature] 8-16-88

8-17-88

06~~4~~0: Arrived. Deconned stainless steel buckets, (5) fence post diggers (2), various bowls + spoons per procedure on page 13, lines 4-7.

~~Got~~ S, 'as together. Drillers began ~~0815~~ decon ~~ning~~ @ 0700. *Procedure on last 4 lines, p. 25

0800: Drillers completed decon. J. Sherwin, M. Roudy & J. Hardeman headed out to Site 2 to begin WP-7S. P. Riemersma and I went to Site 3 to continue gathering surface soil samples.

LOCATION	DEPTH	TIME OF NON-VOLATILE SAMPLE	TIME OF VOLATILE SAMPLE	COMMENTS
DANGB3-SS-A4	1.7-2.0'	0917	0914	dry, silty-sandy, few pebbles
DANGB3-SS-A5	1.8-2.0'	0937	0935	Black organic rich soil.
DANGB3-SS-Z2	1.8-2.0'	1020	1011	Brown soil
DANGB3-SSY2	1.8-1.9	1037	1029	"
DANGB3-SS-B2	1.7-2.0'	1140	1135	"
DANGB3-SS-A2.5	1.7-1.9'	1206	1158	Between A2 + B2.
DANGB3-SS-A3.5	1.7-1.9	1233	1230	Between A3 + B3
DANGB3-SS-D2	1.7-1.9	1511	1506	
DANGB3-SS-D4	1.8-2.0	1545	1537	
DANGB3-SS-D5	1.8-2.1	1604	1600	Near swampy stream.
DANGB3-SS-C5	1.8-2.1	1625	1623	

[signature] 8-17-88

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Procedure for gathering surface soil samples at site 3:

- Dig hole to approximately 2 feet with deconned fence post digger. Use tape measure calibrated to 1/100 of feet.
- When reach designated depth, continue digging, placing soil from hole into deconned stainless steel bowl. Record depth.
- Immediately pack 4 oz. VOA bottle with soil from bowl, using deconned stainless steel spoon. Record time. KCD
- Mix contents of bowl with same stainless steel spoon, then place mixed soil into 1 L Amber bottle using same spoon. Fill ≅3/4 of the way. Record time.
- Place sealed bottles into ice cooler.
- Decon fence post digger, bowl and spoon per procedure on page 13, lines 4-7. Wrap in aluminum foil if they are not to be used immediately thereafter. Otherwise, allow to air dry before using again on next location.
- Note: Sampler(s) are wearing disposable vinyl gloves and changing them after each sample.

1630: Prepared samples for shipment w/ P. Kienenna & J. Sherwin until 1800, then left.

[signature] 8-17-88

8/18/88 M Roddy & J. Sherwin, Sunny, windy 41

LOCATION	DEPTH	Time of VOL sample	Time of Removal	Remarks
DANGB 3SS49	1'4"-1'6"	10:55	11:00	in a gravel lot parking area cobble size
DANGB 3SS D0	1'8"-1'11"	11:20	11:25	gravel & dirt
DANGB 3SS D1	1'9"-2'0"	11:45	11:50	Sand to some gravel water in bottom of hole
DANGB 3SS E1	1'5"-1'7"	12:10	12:15	next to drainage ditch see note

NOTE: This hole, DANGB3SS D1 was flagged SGC-2. This is the wrong location for SGC-2 according to the map and SGC-2 was already located on the ground corresponding to its location on the map & has already been sampled. We therefore guess this flag is in error. We left this flag and added another flag 3SS D1 with the date 8/18/88 added.

LOCATION	DEPTH	Time of VOL sample	Time of Removal	Remarks
DANGB3SS E0	1'8"-1'10"	12:30	12:35	
DANGB3SS E2	1'6"-1'9"	1:00	1:05	9'4" W of SG-E2 in the grass just off the edge of the road. SG E-2 is in the roadway

~~NOTE:~~ 8/18 Finished at 1:15p

J. Sherwin 8/18/88

8/22/88

HNU Calibrated 8 oz detector #: 164716

probe # 50-2088 [illegible] 94.7 ppm isobutylene

supplied by Liquid Carbonic batch # 7488-061588

lot # 2

Note: battery light flickering on and off

Mike Redd

9/27/88

9:53a ~~[illegible]~~ clear, sunny doing water level measurements by myself.

Jo Ann Sherwin 9/27/88

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Well #	Depth to water	Total Depth	pad to protect casing	protect casing to stainless casing	Pad info	Time
10-GW C.	7'11 3/8"	15' 2 1/2"	2' 1 1/2"	- 4"	~5" thick pad, ~2" off ground. wooden form still around pad	10:05
10GW B	9' 11 1/8"	15' 1 3/4"	2' 4 3/16"	- 3 3/8"	~5" thick pad 3"-5 1/2" off ground. wooden form still around pad	10:10
10GW A	7'6 3/4"	22' 11"	3' 3/4"	+ 1 1/16"	~5" thick pad 1 1/2"-4" off ground wooden form still around pad	10:18
2MW41	8' 1 1/8"					10:41
GW2A	5' 10 1/8"					10:49
MW7	5' 2 7/8"					10:52
2MW40	5' 9 1/4"					10:59
2MW39	4' 5"				outer protective cap is resting on inner casing cap	11:03
Continue with Mike Roddy						
MW5	3.92'					11:08
MW6	3.33'					11:10

Jo-Ann Sherwin 9/27/88

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Jo-Ann Sherwin 9/27/88

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Time	Well #	Depth	
11:17	8GW2C	7.91'	
11:18	MW4	7.0'	
11:24	2WP7D	3.01'	Protective caps are resting on inside caps
11:25	2WP7	3.75'	
11:34	2WP6	8.19'	
11:37	GW2B	4.96'	
11:39	2MW38	4.57'	
11:43	MW2	11.25'	well was unlocked - was cut through - cut is rusted
11:45	MW-1 ~~MW2E~~	15.0'	
11:48	GW ~~MW~~2E	12.29'	
11:50	GW2D	13.41'	
11:55	2MW37	3.66'	outside cap resting on inner cap
12:11	2WP8	7.29'	" " " "
12:43	6GMW43	12.40'	
12:50	8MW14	8.83'	
12:51	8MW15	9.66'	
12:54	8GW8C	6.39'	
12:57	8MW16	7.33	" " " "
12:58	8MW17	7.83	"
1307	GW8-B	5.02	
1310	GW8-A	5.80	well was unlocked
13:13	8WP10D	6.93	outside cap rests on inner
13:14	8WP10	6.58	

Jo Ann Sherwin 9/27/88

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1.82 pad to outside TOC + .09 to top inner casing + 2 pad

1.63 " " " " +1.88" " " " +2 pad

Jo Ann Sherwin 9/27/88

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Well #	Time	depth	Top of Outer Cas.	Top of Inner Cas	Pad thick
MW10	1321	5.40			no lock
4MW24	1322	4.40	1.87	1.93	ground built .3" around well
MW8	1326	6.46			
MW9	1328	6.20	no inner caps		
4MW21	1329	6.99	2.05 ~~no cap~~	2.25	.4
4WP12D	1335	5.56	1.60	1.76	.3
4WP12	1336	5.02	1.60	1.70	.3
4WP13D	1341	9.96			
4WP13	1342	8.96			
4MW22	1345	8.77			
GW4-D	1346	9.80			
4MW23	1349	7.96			
GW4-C	1350	10.50			
4WP14D	1352	9.79			
4WP14	1353	8.62			
MW11	1355	7.40			
4WP15D	1358	8.59			
4WP15	1359	7.74			
GW4-A	1432	4.66			
8WP11	1435	9.83			
8WP9D	1438	8.99			
8WP9	1439	8.75			
4WP16D	1444	4.50			
GW4-B	1448	5.04			
3MW27	1452	5.33			

not the surveyors & they are taking all these measurements

Jo-Ann Sherwin 9/27/88

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Well #	Time	Depth	Remarks
3MW26	14:54	6.98	
3MW25	1455	6.84	
3MW29	1458	5.79	
3MW35	1500	5.62	
3MW30	1505	8.29	
3MW31	1508	9.58	
BGMW32	1512	9.11	
3MW33	1515	7.75	
3MW34	1517	6.62	
3MW28	1520	2.88	
GW3-D	1525	6.C	
GW3-B	1528	8.97	
GW3-C	1530	6.15	
GW3-A	1556	11.66	
BGMW42	1657	3.67	

Q.2.5 Notebook 5, Sample Collection Log

This notebook contains sample collection procedures and times for the collection of surface water, sediment and ground-water samples. Ninety eight pages of this book were used. The first entry is 6 September 1988 and the last is 25 September 1988. The entries are signed by Kimberly L. Davis.

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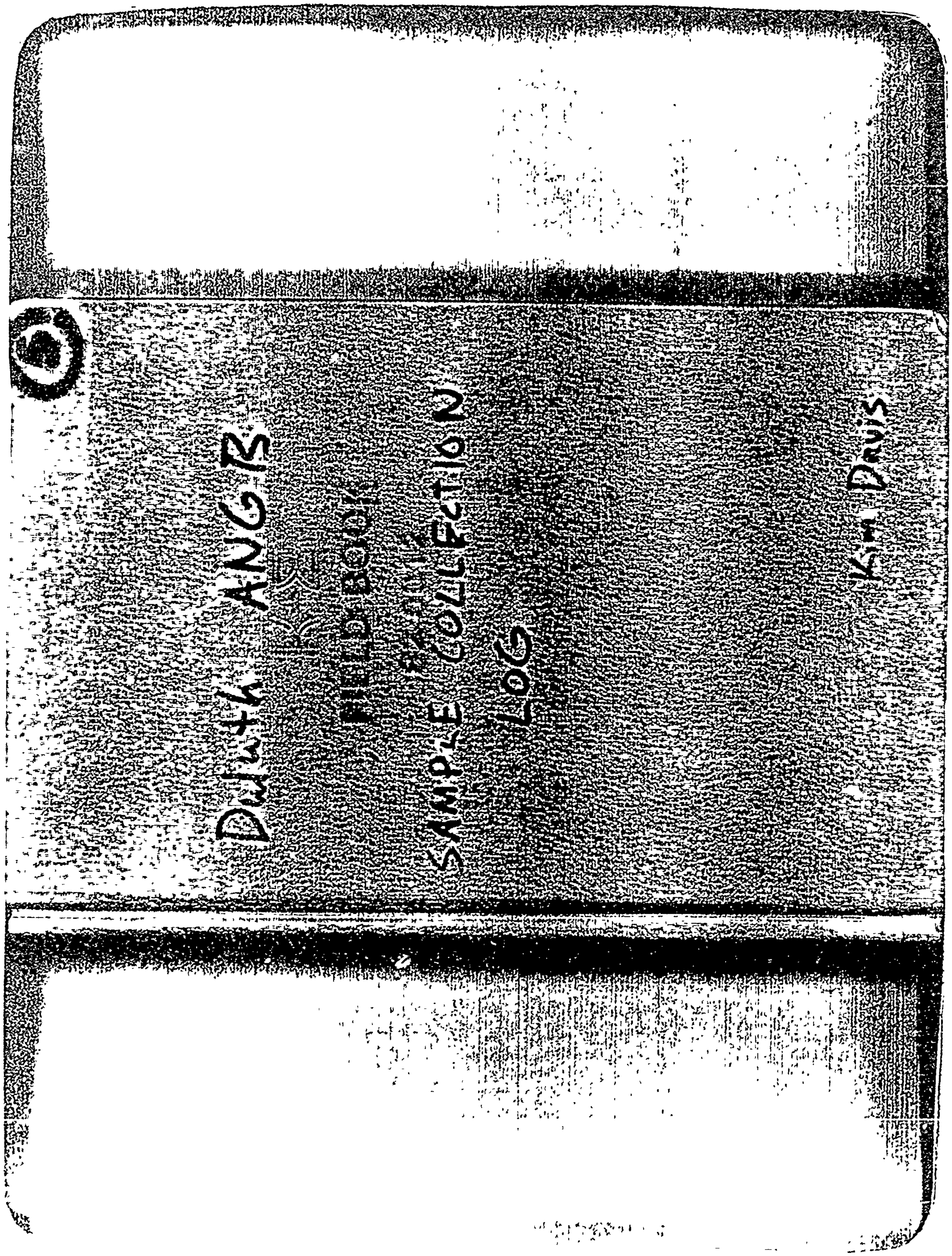
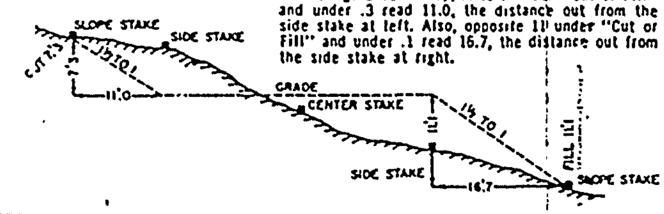

Duluth ANGB
FIELD BOOK
SAMPLE COLLECTION
LOG
Kim Davis

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

KEUFFEL & ESSER CO. For Curve Tables see end of book.

Return to: Robert S. McLeod
Engineering - Science, Inc.
710 S. Illinois Ave
Suite F-103
Oak Ridge, TN 378[illegible]
(615) 481-3920

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Contacts

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Col. Don Solwold HQ MN ANG 612 296 4673
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Sgt. John Wedlund, Facility Mgr. (CE) X 408
Bill Hayden ES Deputy PM 615 481 3920
Sgt. Harold Stevens, supply X 293
Larry Jansson HAZWRAP 615 576 1967
Tom Sturdivant HAZWRAP 615 482 6601
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Kathleen Kidd ES Berkeley Lab (H) 415 939 9475
Bruce Burke Utilities 218 123 7294
Graves (Danny) Drilling 879-2026
624-4344

Emergency Contacts

Base Main Gate Security 723-7280
Fire Department 723-7233
Poison Control 1-800-332-3073

Medical Emergency
Hospital - St. Lukes Hospital of Duluth
Address: 915 East 1st St., Duluth, MN
Phone: (218) 7265555

Base POL's Maj. Joel Manns
CE MN ANG
Work: (218) 723-7290
Home: (218) 728-2633

PM: R.S. McLeod
ES Oak Ridge TN (615) 481 3920
Apt #: (615) 4834613
Home # (404) 953-9603

H+S Officer: Ed Grunwald
ES Atlanta, GA
(404) 325-0776

4

9-6-88

1030: Sharon Shultz, Joanne Beeler, and John O'Brien arrived at Duluth International Airport (DIAP).

1235: Peter Riemersma, Mike Rowdy and Kim Davis arrived at DIAP.

1600: Arrival at office (all six people) after running errands and eating.

1715: Began decontaminating six Teflon bailers, filtrate apparati (2), Keck pump, tubing as per Appendix B of the RI Work Plan, Section 6.6.3, p. 6-10.

Exception: Plastic filter apparati used to filter metals is deconned as such:

(1) Wash with Liquinox.

(2) Rinse with potable water.

(3) Rinse with 10% nitric acid solution.

(4) Rinse with HPLC water.

1745: Sharon Shultz noted that, although deconning outdoors, a layer of black sooty material appeared to keep depositing on freshly deconned equipment.

1800: Deconned water level indicator (GEO) as per the RI WP, App. B, Section 6.6, p. 6-10.

[illegible] 9-6-88

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Lot numbers of various solutions used in decon and sample preparation:

	Lot #
- HPLC Grade Water (Fisher Scientific):	883934, 880929, 883937, 885078, 885079, 882940
- "Optima" Grade Methanol (Fisher Scientific):	882613, 883347, 880 4122N
- Nitric Acid, Reagent ACS, 69-71%, from Colorado Scientific Instrument & Supply Corp. (COSCO):	3E18D
- Hydrochloric acid, Reagent ACS from COSCO:	3F03M
- Sulfuric acid, Reagent ACS from Fisher Scientific:	FL-02-0786
- pH 10.00 buffer from Cole Parmer Instrument Co. (C-P):	8 2692
- pH 7.00 buffer from C-P:	8 2601
- pH 4.01 buffer from C-P:	8 2347

- Yellow Springs Instrument Co. (YSI) 3163 conductivity calibrator,

10,000 micromho/cm: { A85194 065284 B32045D; Expires 1-18-89

1,000 µmho/cm: and { E48675 065280 B32043E; Expires 5-31-89

- Liquid Carbonic 94.7 ppm isobutylene: batch - 9488-061588, lot-12 and batch - 9488-061588, lot-12

[illegible] 9-6-88

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Lot Numbers of sampling bottles:
(All from I-Chem Research)

Type	Lot #, QC #
1 L small mouth ambers,	
Cat. # 349-1000:	8201243, 7431C
Additional lot #'s 8215073	8201203, 7427C
8215323	8201173, 7424C
8215343	
8215063	8201213, 7428C
8215123	
8216143	
8204083	8201223, 7429C
8207143	8209193, 7659C
8207163	
8207183	8201253, 7432C
8209043	
8179133	8208183, 7658C
	8204143, 765?C
	8147123, 4110C
	8147093, 4107C
	8208173, 7657C
	8201233, 7430C
	8208113, 7651C
1 L polyethylene bottles,	
Cat. # 313-1000:	C8195183, C7308C
Additional lot #'s (placed under wrong column)	8179163, 6118C
	8179133, 6115C
	8179173, 6119C
	8179113, 611?C
	C8141123, 4931C

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Type	Lot #, QC #
Cat. # 313-1000 cont.'d	8179153, 6117C
500 mL polyethylenes	8251333, 8251373 KLD 9-22-88
40 mL VOA vials,	
S336 0040:	W8215373, W7756C
	W8215353, W7754C
	W8215383, W7757C
	W8215333, W7752C
	W8215343, W7753C
	W8179013, W5635C
	W8179023, W5636C
	W8179033, W5637C
Lot #'s only	8207183-7143-7133-7163-
	8209013-9043

1900: Completed decon of all equipment listed on page 4. Left.

Kimberly L. Davis 9-6-88

Kimberly L. Davis 9-6-88

9-7-88 Sharon Shultz, Peter Riemersma, Mike Roddy, Kim Davis, John O'Brian, Joanna Becker

0700: Arrived at office. Arranged equipment

0730: Bill Hayden called. Mail nitrate samples to:

Metatrace Inc
13715 Ryder Trail North
Earth City MO 63045
Attn. Rich Mauuz
Tele (314) 298 8566

ES-Berkeley cannot run. Analysis will not be 429.1, but colorimetric. Continue to use sulfuric acid preservative.

0745: Calibrated a HACH conductivity TDS meter, model #4600, serial # 88070 054.

1,000 μmhos/cm standard: .973 μS/cm → 1.000 μS/cm
10,000 μmhos/cm standard: 10.023 μS/cm → 10.000 μS/cm

0810: Calibrated the Orion pH meter, model SA 230, 2617 serial #.
Thermometer (mercury) reads 18.5°C, probe reads 17.1°C
pH 7.00 standard 6.65 → 7.00
pH 10.00 standard 9.98 → 10.00 (adjusted slope)

0825: Prepared to HNU the (6) decontd bailers prior to taking bailer rinsate samples.

Kimberly L. Davis 9-7-88

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Notes: Background in office area is 4 ppm. All bailers and caps registered at background. Some black particles that S. Shultz noted yesterday were visible on bailers & caps.

0900-1000: J. Becker and K. Davis prepared rinsate blanks.

1030: John Hardeman arrival.

1045: K. Davis placed phone call to Cole Parmer to check on coolers. Was told that they had been back ordered, hence their delay.

1050: Called Melanie Bulkzeni in Berkeley. Said she had given responsibility of mailing travel blanks to "Ron." Said she would call back.

1100-1200: Made up lists of analysis #s for labelling, generally organized how to approach sampling. P. Riemersma, S. Shultz and M. Roddy are at Site 8 purging a well.

1315: Joanna Becker and K. Davis went to MW-43, a background well; P. Riemersma, S. Shultz and Mike Roddy had just finished purging when arrived.

1330-1400: Ate lunch.

1400: Joanna B. and J. Hardeman went to get additional supplies from office.

Kimberly L. Davis 9-7-88

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1430-1600: Obtained MW-43 and duplicate, "MW-50", bubblepacked, etc. Took picture of bottles

1600: MW-43:

Temp: 10.2°C

Conductivity: 1030 mS/cm (1030 µmhos/cm)

pH: 6.95

1630-1730: Packed samples

1730: Drove to Fed Ex with samples:

MW-43 Samples, FB-1 VOA ~~Dups~~ Field Blanks

MW-50 MW-43 duplicates

BR-1 Bailer rinsate samples

1815-1915 Made up labels for tomorrow. Shawn Shultz decanned one bailer (the one used at MW-43) using procedure in page four (Appendix B in WP) with a 10% nitric rinse before the final HPLC grade water rinse. The filter apparatus was decanned using procedure on page 4, lines 14-18.

1930: Joanna Beeler decanned the bailer that Pete Riemersma and Mike Roddy used to purge MW-42 using page 4 Appendix B procedure with 10% nitric rinse. Note: This procedure (which was used in page 4 decontamination of six

Kimberly L Olson 9-7-88

bailers (nitric rinse was not noted on p. 4) will be referred to as the Decon-1 procedure from now on.

Kimberly L Olson 9-7-88

Kimberly L Olson 9-7-88

12.

9-8-88 Bob McCool hander duty

0700: Arrival at office.

0730: Calibrated the Hach conductivity meter described on page 8, lines 12-14.

Mercury thermometer reads 20°C, meter reads 19.7°C

1000 µmhos standard: 1060 µS/cm → 1000 µS/cm

10,000 µmhos standard: ~~8710~~ 10,190 µS/cm → 10,000 µS/cm

0740: Joanna Beeler conducted H&S meeting.

0755: Calibrated Orion meter described on page 8, lines 15-16. Temp = 20.0°C

pH 7.00: 6.98 → 7.00

pH 10.00: 9.89 → 10.00

0820: Headed out to MW-42, a background well that P. Riemersma + M. Roddy purged yesterday. (team: K. Davis, J. Beeler, S. Shultz)

0830: Stopped outside gate and prepared bottles.

Note: FB-2 is VOA field blanks for MW-42

0845: Arrival at well, took water level measurement, but water level indicator was broken. Took picture of bottles to be used. Bottles used today and yesterday were in accordance to RI WP, Appendix B, Table 6.2 page 6-4.

Only rinsed bailer once with well water due to poor recharge (usually rinse 2X).

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0930: Took general parameters' measurement

Temp: 11.0°C

pH: 7.72

spec. conductivity: 0.480 mS/cm (480 µmhos/cm)

Around this time, smelled exhaust fumes in air, probably due to the 2 F-4's that took off overhead.

0945: Packed van to leave.

1015: Completed wrapping all samples from MW-42. J. Beeler is preparing bottles for next site, MW-32. Am using this well for matrix spike samples.

1020: John Haideman arrived at office with first shipment of VOA travel blanks (Note: was supposed to arrive yesterday; did not send any yesterday.) K. Davis prepared these labels.

1100: Arrived at the third background well, MW-32 (Site 3). Prepared to sample.

1130: Called Melanie Baltezore to double check on matrix spikes samples, due to S. Shultz's concern that we were not taking enough. Melanie confirmed

K. Davis 9-8-88

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that we need to take (2) 1 L Ambers for each of the following analyses: EPA 608, EPA 625, and EPA 418.1 for a total of (6) 1 L Ambers.
No extra sample is needed for metals analyses; what we are gathering already is sufficient for matrix spikes. This matrix spike batch is taken every 20 samples. Also, no problem of holding times for Site 8 Sampling.

1155: K. Davis measured gross parameters for MW-32:
temp: 11.2 °C
pH: 7.36
spec. conductivity: 1900 uS/cm (1900 umhos/cm)

1230: Left MW-32. Went to office to organize after bubble packing etc.

1320-1400: LUNCH

1410: Arrival at MW-14, Site 8. P. Riemenson & M. Reddy still purging MW-15 next to it. (team = J. Beeler, K. Davis, S. Schultz)
We will be taking field blanks (FB-3) and a duplicate (DANGB-8-MW51-GW-1)
Took picture of bottles prior to sampling.

1420: P. Riemenson & M. Reddy got bailer stuck in MW-15. Then Left to find sling to knock

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it loose.

1450: Gross parameter readings, MW-14
temp: 12.3 °C
pH: 7.03
spec. conductivity: 0.353 mS/cm (353 umhos/cm)

Note: Took MW-51, a duplicate of MW-14.

1545: Finished up MW-14. Went back to office.

1555: Decided to pack up these samples collected thus far for Fed Ex. P. Riemenson & M. Reddy still purging next well after MW-15.

1700: Completed packing samples. Prepared to go to Fed Ex. (J. Beeler & S. Schultz went) K. Davis remained behind and helped P. Riemenson & M. Reddy decon bailers as per Decon-1 procedure in page 11 and decon filter apparatus as per procedure in page 4, lines 14-18.

1745: Made labels for tomorrow.

Note: The following went out today:
MW-42 Samples, TB-1 1st set of travel blanks
FB-2 blanks for MW-42
MW-32 Samples
Matrix Spikes (12) from MW-32

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MW-14 samples

FB-3 blanks from MW-14

MW-51, duplicate of MW-14

1800: Left.

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0700: Arrived.

0715: Calibrated Orion pH probe described on page 8, lines 17-18.

pH: 7.00 std: 7.09 → 7.00

10.00 std: 9.93 → 10.00

0720: Calibrated Hach conductivity/TDS meter described on page 8, lines 14-16.

1,000 μmhos/cm std: .970 μS/cm → 1.000 μS/cm

10,000 μmhos/cm std: 9.66 μS/cm → 10.000 μS/cm

Made out labels

This morning plan to sample MW-15, which will have FB-4 associated with it. Also, MW-17, which will have FB-5 associated with it.

0730-0845: Took BR-2 bailer rinsate, for site 8 parameters.

0830: Arrived at MW-15. Prepared to sample. Team: Pete Riemenschneider, Kim Davis, Shawn Shultz, Jammie Beeler

0900: Took gross parameter readings, MW-15. Water is cloudy and difficult to filter.

temp: 9.8°C

pH: 9.07

spec conductivity: 0.26 mS/cm (260 μmhos/cm)

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Sharon Shultz noticed a bubble in the travel blank VOA bottle (TB-2).

0945: J. Baker conducted a safety meeting

0930: Went to MW-17. Took FB-5.

0940: Sampled MW-17.

1020: Took gross parameter readings. Water at this well is very, very silty causing metals filtration to go slowly.

temp: 9.9°C

pH: 7.23

spec. conductivity: 0.67 mS/cm (670 µmhos/cm)

1100: Sampled MW-16, located next to MW-17. First, Sharon Shultz deconned the filtration apparatus used on MW-16 using procedure on page 4, lines 14-18. (We have two filtration apparati with us in van; one is still dirty from MW-15.)

1120: Took gross parameter readings. Water is same as MW-17.

temp: 10.2°C

pH 8.62

spec conductivity 0.384 mS/cm (384 µmhos/cm)

1135: Went back to office to decon ~~(3) bailers~~ and filtration apparatus using procedure on page 4, lines

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14-18. K. Davis continued filtering MW-16 metals samples.

- Change of plans in sampling.

Were going to sample 2 wells on Site 8 today. However, cannot find keys to these wells (Stage 2 Phase II wells). Therefore we will move to Site 4 and sample them. P. Rieman and M. Roddy are purging MW-21 now. (Site 4)

1200: S. Shultz deconned (2) bailers using Decon-1 procedure on page 11.

1230-1310 LUNCH

1315: Headed to Site 4, MW-21.

1330: Pulled MW-21 sample.

1335: Gross parameter measurements: Water is very clear and free of silt-

temp: 12.0°C

pH: 7.78

spec. conductivity: 1.30 mS/cm (1300 µmhos/cm)

1345: Went to office, picked up supplies.

1400: J. Baker & K. Davis took S. Shultz to airport - she is departing for Atlanta

Headed to Site 8 to MW-GW8C.

1430: Took sample from GW8C

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15:15: Took gross parameter readings:
Water moderately cloudy.
temp: 15.4 °C
pH: 6.69
spec. conductivity 0.98 mS/cm (980 μmhos/cm)

P. Kremerson + M. Reddy are having problems getting water from GW8-B; therefore, since there are no more wells anyway. Therefore, will stop here.

Note: Took photos of all bottles today prior to sampling events.

15:45: Began wrapping samples, packing, etc.

1710: Handed Fed Ex with following:
MW-15 with FB-4 field blank
MW-17 with FB-5 field blank
MW-16
MW-21
GW8C
BR-2 with site 8 parameters
TB-2 travel blank #2, filled 9-7-88.

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Note: Joanna Baker called Berkeley lab at 1630 to O.K. the Saturday delivery for these samples.

1745-1900: Deconned (2) filter apparatus as per page 4, lines 14-18. Deconned (5) bailers as per Decon-1 procedure on page 11.

Prepared bottles for tomorrow.

1900: Left.

Weather: Sunny, very breezy 20-30 mph gusts, 75 °F high.

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0700: Arrival at office. Joanna Beeler conducted H+S meeting (P. Riemann, M. Reddy, K. Davis, J. O'Brien in attendance).

0735: Calibrated Orion pH probe described on page 8, lines 17-18.

4.00 standard: 3.93 → 4.00

7.00 standard: 7.04 → 7.00

0745: Helped J. Beeler fill up BR-3 bailer rinsate VOA vials. We both noted a heavy exhaust smell lingering in air; probably from jet that just took off. She filled rest.

0750: Calibrated Hach conductivity meter described on page 8, lines 14-16.

1,000 µmhos/cm std: 1.016 mS/sec → 1.000 mS/sec

10,000 µmhos/cm std: 9.83 mS/sec → 10.000 mS/sec

0900: Headed out to Site 4, MW-22.

Taking a field blank FB-6 at this well. (team = Kim Davis and Joanna Beeler)

0915: Pulled sample from MW-22.

Took picture prior to getting sample

0930: Gross parameter measurements:

temp: 9.4°C

pH: 7.39

spec. conductivity: 1.26 mS/cm (1260 µmhos/cm)

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Water is slightly cloudy; not too bad to filter.

1000: Went to MW-21. Took picture of bottles.

→ NOTE: Yesterday, all references to MW-21 should be MW-23.

This is an error on the chain of custody although the bottles are all correctly labelled.

1015: Pulled MW-21 sample. John Hardman borrowed the conductivity and pH meters, therefore we must wait for him to return it before moving on to next well. Finally, decided to just put some sample in a bottle to measure pH + conductivity a little later. Deconned filtration apparatus with (1) nitric 10% rinse, (2) HPLC H_2O rinse.

Note: MW-21 and MW-22 had been painted earlier this morning and were slightly sticky on the cap for the outer casing. No paint odor was detected, however.

1105 Went to MW-24.

Strong smell of JP-4 in air, probably due to truck that is refueling about 75 feet east

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~~9-10-98~~

OK MW-24.

1120: Pulled MW-24 sample after taking picture of bottles.

1135: Deconned filtration apparatus using (1) 10% nitric rinse, (2) HPLC H_2O rinse.

1136: J. Hardeman finally returned pH and conductivity meters. Took readings:

MW21:

Water fairly clear.

pH: 7.01

temp: 20.2 °C (warm temp due to sitting out)

conductivity: 0.733 mS/cm (733 μmhos/cm)

MW24:

Water very cloudy, difficult to filter.

pH: 8.51

temp: 19.8 (warm temp due to sitting out in bottle)

sp. conductivity: 0.730 mS/cm (730 μmhos/cm)

1200: Headed to office to pick up 1" bailer to do GW8B.

1205: Left message at Berkely Lab for Melanie Baltezore that all MW-21's on c-o-c yesterday should be MW-23.

[signature] 9-10-98

9-10-98

1300: Went to GW8B, Site 8.

Note: While at office, deconned the new 1" bailer using Decon-1 procedure described on page 11.

1320: Took gross parameter readings:

Water very very silty, difficult to filter.

temp: 12.2 °C

pH: 7.45

sp. conductivity: 13.0 mS/cm (1300 μmhos/cm)

1500: Headed to GW8A after deconning 1" bailer using Decon-1 procedure described on p. 11. Also deconned the filter apparatus using (1) 10% nitric rinse, (2) HPLC H_2O rinse.

1510: Took pictures of bottles and pulled sample.

1535: Gross parameter readings:

Water same as in GW8B.

temp: 12.2 °C

pH: 7.04

sp. cond.: 1.02 mS/cm (1020 μmhos/cm)

1600: Packed samples

1640: Went to Fed Ex with samples

See next page for list.

[signature] 9-10-98

9-10-84

Samples shipped out today:

BR-3 with Site 8 parameters

FB-6 - MW22 VOA blank

MW-22

MW-21

MW-24

GW8A

GW8B

KO TB-3

1705: Came back to office. Prepared to decon (3) 2" bailers and (1) 1" bailer. These will be deconned using Decon-1 procedure on page 11. Deconned (2) filter apparatus as per procedure on page 4, lines 14-14.

1840: Left, after adding preservatives to tomorrows' bottles.

Weather today: Calm breezes, hazy skies, high of 70°F.

Kent L. Davis

Kent L. Davis 9-10-84

9-11-84

0800: Arrived at office. Prepared ice for coolers, organized schedule.

0910: Calibrated Orion pH probe described on page 8, lines 17-18.

4.00 standard: 4.04 → 4.00

7.00 standard: 7.02 → 7.00

temp probe reads 18.8°C, Hg thermometer = 19.8°C.

0925: Calibrated Hach sp. conductivity probe described on page 8, lines 14-16.

1000 µmhos/cm std: 1.02 mS/cm → 1.00 mS/cm

10,000 µmhos/cm std: 9.83 mS/cm → 10.00 mS/cm

temp reads 19.2°C, Hg thermometer = 19.2°C

From this point on, will use Hach probe to read temp. instead of Orion probe.

0900-0930: J. Beeler prepared BR-4, bailer rinsate using Site 4 parameters.

team: K. Davis, J. Beeler

1000: Went to GWTC Site 4 to sample.

1025: Took field blank, FB-6.1. KO

1030: Took sample from GWA-C.

1100: Took duplicate, "MW51".

Kent L. Davis 9-11-84

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9-11-88
Note: Took picture of bottles prior to sampling.
1205: Gross parameter measurements:
Water very silty, difficult to filter
temp: 11.3°C
pH: 7.60
sp. conductivity: ~~1.40~~ 1.192 mS/cm
(1192 µmhos/cm)
1235: J. Beeler deconned (1) filter apparatus using 10% nitric rinses then HPLC H_2O.
1240: Moved to MW-9.
Enroute, got stuck in ditch. Therefore, ate lunch, called tow truck and made labels.
K. Davis deconned (1) additional filter apparatus using 10% nitric rinse, then HPLC H_2O. J. Beeler deconned the 1" bailer that we used on GW4C to use on MW-9. Used Decon-1 procedure described in page 11.
1545: Pulled MW-9 sample after taking picture of bottles. A field blank, FB-8, was taken at 1535.
1645: Took gross parameter readings:
Kimberly Z. Davis 9-11-88

29

9-11-88
Water is very very silty and difficult to filter. We suspect this is due to all previously existing wells from Phase III, Stage I and Stage II having not been developed and remaining untouched for ≃5 years.
temp: 15.7°C
pH: 6.74
sp. conductivity: 0.843 mS/cm (843 µmhos/cm)
1730: Took GW4B sample after taking picture.
1805: Gross parameter readings:
Water very very silty and hard to filter.
temp: 11.1°C
pH 7.77
sp. conductivity: 0.429 mS/cm (429 µmhos/cm)
1815: Continued to filter until 1900.
1900: Went back to office. Deconned all bailers as per Decon-1 procedure on p. 11. Deconned (2) filter apparatus as described on page 4, lines 14-18. Packed samples. Cleaned office.
2045: Left. (Weather: sunny, breezy, 68°F.)
Kimberly Z. Davis 9-11-88

30

9-11-88

List of what went out today:

BR-4 bailer rinsate using site 4 parameters
TB-4 travel blank
GW4C⁴ with FB-7 travel blank
MW-51⁴ - dup of GW4C
FB-8 - field blank of MW-9
MW-9⁴
GW4B⁴

MATRIX SPIKE (2) (AL 9.1)

this should be MW-52 MLD 9-13-88

9-11-88

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9-12-88

0715: Arrived. J. Beeler placed call to Sharon Shultz to order more filter papers, white tape, 1 L polyethylene bottles, thermometer.
0800: Went to pick up supplies.
0830-0930: Made telephone calls
0930: Took BR-5, bailer rinsate. This rinsate came from the 2" bailer only, since that will be the only one we use today. (Only Phase II Stage I + II wells will be sampled today, which requires this small bailer.) BR-5 was for Site 4 parameters only.
1030: Henrique Centzsch arrived; requested that MW-29 on site 3 be split with him. If time, will try MW-22, next. Said that he would return after lunch.
Continued to make labels, work on written requests from O.R. office. M. Roddy + P. Rumeson ran errands.
- J. Beeler called Berkeley Lab this A.M to change chain of custody from 9-9-88 and to ask where trip blanks were. M. Balterani

9-12-88

9-12-88

and Ron — told her that they shipped them 9-7-88 (that we received) and that we were to open them and add HCl preservative "preferably in our motel room" before shipping them. K. Davis called Sharon Shultz to discuss this and was told that this methodology would turn the trip blank into a field blank, essentially, and recommended very highly against this procedure.

1210: K. Davis called M. Battezone and expressed concern over holding times being exceeded on our trip blanks dated 9-7-88 and was told by M.B. and Ron — that there were no holding times on trip blanks. Terminated conversation at this point.

1230: K. Davis Called Richard Westmoreland, Martin Marietta. Notified him of impending splits (2 samples) with all of analyses! Also asked him what his methodology about trip blanks was. He said the lab should preserve the trip blanks from the start, and there is no danger of exceeding holding times. He said that there was no way one could open a trip blank and add preservative without getting

9-12-88

9-12-88

bubbles in the vials, and therefore should not be opened.

K. Davis kept working on O.R. office's request for information.

1300: K. Davis delivered by phone all information to J. Sherwin.

1320: Henrique G. returned. We agreed to meet at Site 3 shortly.

1335: Calibrated Orion pH meter described on p. 8 lines 17-18.

4.00 standard: 4.04 → 4.00

7.00 standard: 6.98 → 7.00

Calibrated Hach conductivity meter described on p. 8, lines 14-16.

1,000 µmhos/cm standard: 1.008 ~~µS~~/cm → 1.000 µS/cm

10,000 µmhos/cm standard: 9.88 → 10.00 mS/cm

Hach temp: 21.2°C Hg thermometer temp: 21.2°C

1400. Headed out to MW-29. Set up bottles for Berkeley and Mitzi Miller and took picture. ~~Mitzi Miller~~ KID E.S. is also getting FB-9 (Field blank) and Berkeley is getting TB-5 (travel blank).

1415: Began pulling samples: team: K. Davis, J. Beeler, H. Gentzsch

9-12-88

9-12-88

1540: Henrique left to check on Pete Kremmsma and M. Roddy. It turned out Henrique only wanted VOA's.

1600: Took gross parameter readings:
Water cloudy, but not too difficult to filter
Temp: 19.0 °C
pH: 7.24
Sp. conductivity: 0.820 mS/cm (820 µmhos/cm)

1600–1715: Packed samples.

1715: Henrique left.

Note: Joel Munns approached us today to ask when the 55 gal. drums would be removed. (Soil drums need to be tested for EP Toxicity and water drums are awaiting water analyses.)

1730: Brought following to Fed Ex:
BR-5 using site 4 parameters.
(This was before Henrique showed up and changed our plans to site 3, MW-21)
(2) MW-29 – one to ES, one to Berkeley
TB-5 to ES
FB-9 to ES

[signature] 9-12-88

Need to call Mitzi Miller or Richard Westmoreland to ask if they need a field blank, which was inadvertently forgotten.

1730: P. Kremmsma deconned the 2" bailer used today using Decon-1 procedure on p. 11 and deconned the (2) filter apparati using the procedure described page 4, lines 14–18.

1815: Left. Weather 65°F, cloudy, breezy

[signature] 9-12-88

 9-13-88

0715: Arrived. Made phone call to Oak Ridge. Sample team - J. Beeler + K. Davis

0805: Calibrated Orion pH probe described on page 8, lines 12-15.

4.00 standard: 4.03 → 4.00

7.00 standard: 6.98 → 7.00

Calibrated Hach conductivity meter described on page 8, lines 14-16.

1,000 µmhos/cm std: 1.073 → 1.000

10,000 µmhos/cm std: 9.68 → 10.00

temp: 17.2°C Hg thermometer temp: 17.5°C.

0900: Headed out to MW-8, Site 4.

0910: Took picture - team - K. Davis J. Beeler

0915: Began pulling samples.

0925: While filling VOA vials, two JP-4 trucks passed within 5 feet of our table causing heavy diesel fumes to be noticeable in the air.

0935: Poured sample to be filtered into a clean container. Water was so murky, that after 5 minutes, only top ½ inch of container was settled out enough in order to allow light to pass through slightly.

Kirk R Davis 9-13-88

Took picture of water from this well.

0945: Took gross parameter readings (see above for water description.)

temp: ~~13.2°C~~ KRD 14.2°C

pH 6.49

sp. cond.: 0.558 mS/cm (558 µmhos/sec)

1075: Decontaminated (2) filter apparatus using 10% nitric rinse and HPLC water. The container used to hold sample in order to allow settling will be decontaminated using ~~Decon - 1 procedure~~ KRD page 4, lines 14-18 procedure.

Note: P. Riemensen + M. Roddy are re-purging Site 4 wells that they did Sunday, and we were unable to get to yesterday due to MPLA being here.

1040: Went to MW-20, Site 3 (M. Roddy + P. Riemensen purged this one yesterday at the request of Henrique Contosel. in anticipation of sampling it)

1055: Took Picture of bottles.

1100: Pulled sample.

Kirk 2 Davis 9-13-88

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9-13-88

1115: Took gross parameter readings.
Water very silty towards end of bailing when we were attempting to filter metals.

temp: 14.1°C
pH: 7.85
sp. conductivity 0.671 mS/cm (671 µmhos/cm)

On this well, tried using 5.0 µm prefilters before a 0.45 µm filtering stage. We found that the 5.0 µm filters were almost as slow as the 0.45 µm filters.

1200 - 1330: LUNCH, Deconned 1" bailer using Decon-1 procedure on page 11.
Also deconned (2) filter apparati using procedure on p. 4, lines 14-18. The container used to hold sample in order to settle prior to filtering was also deconned using these same procedure.

1345: Headed out to GW4A, Site 4

1400: As we were preparing to pour samples (took picture beforehand), Johanna Bealer spilled nitric acid on arm. Went back to office

[signature] 9-13-88

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9-13-88

to attend to.

1420: Returned to GW4A. Continued to sample.

1500: Took gross parameter measurements. Water very silty and difficult to filter.

temp: 16.1°C
pH: 6.74
sp. conductivity: 0.680 mS/cm (680 µmhos/cm)

9-13 1220

Notes: Called Richard Westmoreland today to see if samples arrived. He said that he is sharing responsibility with Amad Haouma (sp. foreign) and he might know. From now on, he said, only send parameters that MPCA collects. (I explained that we had already prepared bottles before realizing that Henrique Goetzsch only wanted VOA samples.) Also, it is not necessary to send a field blank to Martin Marietta, as long as we retain one to send to ES Berkeley.

1540: Finished GW4A. Went to decon 1" bailer using Decon-1 procedure on page 11 and to decon (2) filter apparatus and sample holder/settler using procedure

[signature] 9-13-88

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9-13-88

outfit on page 4, lines 14-18.
Johanna Beebe deconned.
1600: Headed out to GW4D at Site 4.
1620: Took sample (after taking picture).
1635: Took gross parameter readings.
Water is very very silty.
temp: 12.1°C
pH: 6.45
sp. conductivity: 1.066 mS/cm (1066 µmhos/cm)

1645: Headed back to office to filter metals for this well and to pack the coolers.
Going out today:
GW4A
GW4P
MW 8 (Site 4)
MW 26 (Site 3)
TB-6
1730: Went to Red Ex
1800: Prepared bottles for tomorrow
1835: Left.
Weather: Cool (60-65°F), Sunny, sporadic breeziness (0-25 MPH)
Kimberly L. Davis 9-13-88

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9-14-88

0710: Arrived. Received phone call from Bill Hayden. BR-3 bailer rinseate sent out on 9-10-88 did not have EPA 608's checked on chain of custody. Told him it should have been checked!
0730: Talked to Bob McLeod. He said to hold off on ordering bottles until we are clear what MPCA wants as far as (1) Whether we should wait for results before conducting 2nd sampling round and (2) Whether we will sample all wells or just ones with "hits."
0800: K. Davis calibrated Orion pH meter described on page 8, lines 17-18.
4.00 standard: 4.04 → 4.00
7.00 standard: 7.00 → 7.00
Calibrated Hach conductivity meter described on page 8, lines 14-16.
1,000 µmhos/cm std: 1.043 mS/cm → 1.000 mS/cm
10,000 µmhos/cm std: 9.78 → 10.00 mS/cm
Hach temp: 16.8°C, Hg thermometer: 17.9°C
0815: P. Riemersma and M. Roddy prepared BR-6, bailer rinseate with Site 3 parameters.
Kimberly L. Davis 9-14-88

9-14-88

0820: J. Becker + K. Davis (sample team) went to MW-11, Site 4.

Note: We realized today that MW-26, Site 3 should not have been sampled; MW-25 was purged next to it. Therefore MW-26 will be re-sampled and MW-25 will be re-purged. From now on, all purged wells will be marked and dated.

0830: ~~Headed~~ Prepared to sample MW-11. Took picture.

0845: Pulled sample from MW-11

0910: Measured gross parameters

Water very silty, difficult to filter

temp: 13.0

pH: 6.90

sp conductivity: 0.690 mS/cm (690 µmhos/cm)

0945: Went back to office. Decontaminated (2) filter apparatus using 10% neitric rinse, then HPLC grade water rinse. Decontaminated 1" bailer used on MW-11 with Decon-1 procedure on page 11. Packed (1) cooler and sealed.

[signature] 9-14-88

9-14-88

1015: Took picture, pulled sample at MW-10.

1100: Took gross parameters measurements. Water slightly cloudy, not too bad to filter.

temp: 17.2°C

pH: 6.96

sp. conductivity: 0.451 mS/cm (451 µmhos/cm)

1125: Went back to office. Called Kathleen Kidd to ask about travel blank holding times ("no holding time"), whether Ron (ES Bailey) was correct in saying one opens TB's before sending one out to preserve w/HCl ("no, the lab is supposed to preserve them before sending out").

→ Kathleen said that a rolling cart used to transport samples collapsed yesterday, breaking an unknown number of samples from 9-12-88.

1200: LUNCH and errands.

1420: Went out to MW25 and MW26 (pair)

1500: Began sampling MW25 at 1500 after taking picture.

[signature] 9-14-88

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9-14-88

1505: Took gross parameter readings:
Water slightly cloudy; not too difficult to Filter. (Only used (1) filtering apparatus)
temp: 16.0
pH: 7.81
sp. conductivity: 0.694 mS/cm (694 μmhos/cm)

1600: Took MW-26 sample after taking picture. This sample has a duplicate named MW-53 scheduled for 1630.

1615: Took MW-26 gross parameter readings:
Water very silty and difficult to filter.
temp: 17.7°C
pH: 6.80
sp. conductivity: 0.435 mS/cm (435 μmhos/cm)

1615: Went back to pack samples and to continue filtering metals.

1730: Went to Fed Ex with:
BR-6 with Site 3 parameters
MW-11, Site 4
MW-10, Site 4
MW-25, Site 3
MW-26, Site 3
MW-53, dup of MW-26

Kimberly Z. Davis 9-14-88

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9-14-88

Sometime this afternoon, Melanie Baltezar called to verify bottle breakage which occurred at Berkeley yesterday. The following broke:

GWAC: all 5 VOA vials
MW29, Site 3: (2) 418.1
(2) 608
(2) 625
FB-9: (2) VOA vials

Peter talked to M. Baltezar and told her ~~to~~ to not analyze MW-26 sent out yesterday due to the fact that it was not purged. (We resampled it today.)

Also, we took a duplicate of GWAC, called MW-52. We are considering just using that sample to serve as GWAC for the broken 5 VOA vials at this point.

M. Baltezar suggested to put all resampled bottles on a separate chain of custody and mark "re-sampled."

Kimberly Z. Davis 9-14-88

9-14-88

1630: Deconned (2) filter apparatus using procedure described on page 4, lines 14-16. All bailers used today (2" and the 1") were deconned using Decon-1 procedure on page 11.

1850: Left.

Weather: Cool (75°F), sunny, slight breeze

9-14-88

9-15-88

0745: Arrived. Decided to resample GW-4C. Caught up on some paperwork

0915: K. Davis calibrated Orion pH meter described on page 8, lines 17-18.

4.00 standard: 4.03 → 4.00

7.00 standard: 7.01 → 7.00

Calibrated Hach conductivity meter described on page 8, lines 14-16:

1,000 µmhos/cm std: 1.053 → 1.000 mS/cm

10,000 µmhos/cm std: (see below)*

Hach temp: 17.6°C Hg thermometer temp: 17.5°C

* Decided to just use 1,000 µmhos/cm std. from now on, since most samples collected thus far fall in the 500-1500 µmhos/cm range. The procedure specified in the Hach manual for this meter only uses one standard (see page 14 of this manual, published by the Hach Company, 1987, 1988).

1005: Called Kathleen Kidd to tell her to cancel analysis of GW4C remaining bottles and all of MW52.

1015-1115: Picked up 80 coolers from the Base loading dock and met John Hardeman at airport

9-15-88

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9-15-88 Sampling team: K. Davis, J. Beeler

1130: Headed out to MW-29, Site J to re-sample (2) EPA 418.1, (2) EPA608 and (2) EPA625 1 L Amber bottles to replace ones that ES-Berkeley broke.

1135: Took picture, and pulled samples.

1150: Took gross parameter readings.

temp: 17.0°C

pH: 7.05

sp. conductivity: 0.682 mS/cm (682 µmhos/cm)

1155: Decided to take Field Blank, FB-10 at this site (was not in picture).

1200: Went to MW-27.

1215: Took picture, then pulled samples. Extremely slow in recharging. After filling VOA's, well was almost dry. Ate lunch between 1230-1300.

1300: Pulled 1 L from MW-27 before it went dry again.

1400: J. Hardeman arrived on scene. Decided to leave bailer in well and check later due to lack of water. At this point, only have (5) VOA vials, and (2) 1 L metals, and (6) ambers 1 L bottles which are filled 1".

Robert Z. Davis

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9-15-88

1415: Came back to office; decon'd filtering apparatus with 10% nitric rinse and HPLC grade water. Placed phone calls.

1530: Went back to MW-27. Still dry. Decided to go ahead and sample MW-33 (J. Beeler and John Hardeman) while K. Davis wrapped bottles, filled out C-O-C, etc.

1615: Pulled sample from MW-33 after taking picture.

1640: Took gross parameter measurements. Water silty and difficult to filter.

temp: 10.8°C

pH: 7.49

sp. conductivity: 1.362 mS/cm (1362 µmhos/cm)

1700: Came back to office and packed.

1715: J. Hardeman & J. Beeler drove to Fed Ex; K. Davis remained at office to decon filtration apparatus ~~FIES~~ using procedure outlined on page 4, lines 14-18.

Also, K. Davis is rinsing out the (6) 1 L Ambers from MW-27 with HPLC H_2O to use tomorrow at MW-27.

Robert Z. Davis 9-15-88

50 9-15-88

To Fed Ex today:

MW-27, Site 3 (just VOA's + metals)
MW-33, Site 3
TB-7
MW-29 (resampled (6) 1 L ambers from breakage at ES lab)
FB-10 - field blank at MW-29 to replace FB-9 that was broken.

1800-1900: Prepared bottles for tomorrow.
1900: Left.

Weather: Cool (65°F), cloudy; rained at 1800 and continued for rest of evening.

9-15-88

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9-16-88

0710: Arrived. Raining heavily. Prepared to take a bailer rinseate, BR-7 with Site 3 parameters. (J. Hardeman, P. Riemersma, M. Kelly)

0745: Calibrated Orion pH meter described on page 8, lines 17-18

4.00 standard: 4.03 → 4.00
7.00 standard: 7.07 → 7.00

Calibrated Hach conductivity meter described on page 8, lines 14-16.

1,000 µmhos/cm standard: 1.104 mS/cm → 1.001 mS/cm
Hach temp: 16.6°C   Hg thermometer temp: 17.8°C

0845: Drive to ~~BW4C~~ to re-sample (due to bottle breakage) along with the duplicate, MW-52. Still raining heavily; windy. J. Hardeman helped set up tarp over well and sampling table.

NOTE: TB-8, (1) of the vials has a bubble in it.

0945: Took picture of bubbles, then pulled GW4C, then MW-52 samples.

Sampling Team: P. Riemersma, K. Davis

9-16-88

9-16-88

1100. Took gross parameter measurements

Water slightly silty; we will filter back in office.

temp: 9.3°C

pH: 7.45

Sp. Conductivity: 1.102 mS/cm (1102 μmhos/cm)

1115–1145: Filtered metals at office.

Placed phone calls.

1230: Went to MW-27 to try to get rest of 1 L ambers (6). Rain has subsided somewhat; just misty now.

1245: Could only get (1) 1 L Amber, EPA 608 from this well (Took picture prior to sampling). Well went completely dry after this.

1315–1400 LUNCH

1415: Divided up into 2 sampling teams

K. Davis + P. Riemersma went to MW30,

J. Hardeman + M. Reddy went to MW ~~34~~.

Before going, deconned filter apparatus using 10% nitric rinse and HPLC grade water.

1445: K. Davis took picture of MW-30 bottles prior to filling 1st sample

9-16-88

1500: J. Hardeman + M. Reddy pulled sample from MW-34 after taking pictures.

1515: During fill-up of bottles from MW-30, accidentally poured sample directly into metals bottles (about 200 mL each). We will pour this out, rinse bottles with HPLC grade water, add 5 mL HNO_3 to each and pour filtered sample into them. (We are using same bottles due to rapid depletion of polyethylene bottles. This rapid usage stems from using unpreserved bottles to store unfiltered sample prior to sampling, which was not taken into account for when initially ordering.)

1545: Took gross parameter readings, MW-30

Water slightly cloudy, not too difficult to filter.

pH: 7.38

temp: 10.6°C

Sp. conductivity: 0.524 mS/cm (524 μmhos/cm)

9-16-88

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9-13-88

1400: Took parameter readings for MW-34; water very murky and difficult to filter.

pH: 6.48 (? meter was deviating)

temp: 9.8

sp. conductivity 0.800 mS/cm (800 μmhos/cm)

1610: P. Riemersma & K. Davis returned to office to filter MW-34 and pack. J. Hardeman & M. Roddy continued purging Site 3 wells.

Note: J. Hardeman called Berkeley lab ≈1000 this AM to warn them of impending Saturday shipment and 12 day holding time. Secretary took message since no one was available to talk on phone.

1730: P Riemersma and K. Davis went to Fed Ex with:

MW-30 site 3 TB-8

MW-34 site 3

GW4C site 4 re-sample

MW-52 resample of GW4C dup

BR-7 using Site 3 parameters

MW-27 site 3 just (2) 625 1 L ambers

[signature] 9-16-88

55

9-16-88

Weather today was driving rain this morning, subsiding to a mist. Temp: 60°F.

1930: Left, after deconning filtration apparatus with 10% nitric rinse & HPLC rinse.

[signature] 9-16-88

9-17-88

0710: Arrived.

0730. Calibrated pH meter described on page 8, lines 17-18

~~temp~~ 4.00 standard 3.99 → 4.00

~~pH~~ 7.00 standard: 6.98 → 7.00

~~sp conductivity~~

Calibrated Hach sp. conductivity meter described on page 8, lines 12-14.

1,000 µmhos/cm std: 1.000 mS/cm (1000 µmhos/cm)

Hach temp: 17.9 - Hg thermometer: 18.2

0745: Made out labels.

0815: Divided up into 2 sampling teams again. J. Hardeman, M. Reddy on one, P. Riemersma + K. Davis on other. We are planning to sample GW3A, GW3B, GW3C and GW3D, which are all clustered together.

0825: Found DANGB-BRT EPA418.1 bottle laying on table that was supposed to be included in yesterday's shipment.

0845: K. Davis, P. Riemersma went to GW3C to begin sampling. We are taking FB-11 here.

[signature] 9-17-88

9-17-88

0915: K. Davis + P. Riemersma pulled GW3C sample after taking picture. FB-11 was pulled @ 0920.

0920: J. Hardeman + M. Reddy pulled GW3B. They are taking a duplicate, MW54, scheduled @ 1000.

1000: Took gross parameter readings for GW3C. Water is too silty to even begin filtering in the field. We are pouring into bottles to allow settling.

temp: 16.9°C

pH: 5.80

sp. conductivity: 0.173 mS/cm (173 µmhos/cm)

Took gross parameter readings of GW3B. Water same as above.

temp: 11.3°C

pH: 6.18

sp. conductivity: 0.800 mS/cm (800 µmhos/cm)

1045: K. Davis + P. Riemersma prepared bottles for GW3A.

1100: K. Davis + P. Riemersma took picture

[signature] 9-17-88

9-17-88

of GW3A then sampled, and M. Reddy & J. Hardeman took picture of GW3D and sampled.

NOTE: For this morning's sampling (GW3A, GW3B, GW3C, GW3D, MW52 & MATRIX SPIKE), bailers were left in wells from purging. We used these same bailers to sample. Therefore, we couldn't take bailer rinseate as scheduled this AM. This would have been BR-8, which will be taken 9-19-88.

1145: P. Kornman measured gross parameters at GW3A. Water cloudy, will filter back at office.

temp: 11.4°C

pH: 7.18

sp. conductivity: 0.420 mS/cm (420 μmhos/cm)

— GW3D gross parameters: (water quality same as above)

temp 9.6 °C

pH ~~6.8~~ KLD 6.3

sp. conductivity 720 μmhos/cm

Kimberly L Davis 9-17-88

9-17-88

1200: Came back to office. M. Reddy & P. Kornman decontaminated the (4) stainless steel bailers used this morning using Decon-1 procedure with the exception of the substitution of 5% nitric rinse for the 10% nitric rinse. From now on, this stainless steel bailer decon procedure will be called "Decon-2".

J. Hardeman filtered samples.

K. Davis prepared chain of custody's; packed and inventoried supplies.

1600: Finished filtering & packing.

Went to Fed Ex with:

GW3A

GW3B

GW3C

GW3D

MW54 (dup of GW3B)

MATRIX SPIKE (6 AMBERS)

FB-11

MW-27 (2) 608's

1845: Prepared to leave.

Weather: Sunny, warm (75°F), no breeze.

Kimberly L. Davis 9-17-88

60

9-18-88 - DAY OFF

9-19-88

0710: Arrived.

0720: P. Riemersma calibrated the Orion pH meter described on page 8, lines 17-18.
7.00 standard: 6.98 → 7.00
10.00 standard: 9.84 → 10.00

He also calibrated the Hach conductivity meter described on page 8, lines 12-14.
1,000 µmhos/cm standard 0.993 → 1.000 mS/cm

0800: Poured bailer rinsates from (3) teflon bailers. BR-8, using Site 3 parameters. These bailers will be used to finish off Site 3 today on MW-28, MW-31 and MW-35.

0830: J. Hadaway & M. Reidy went to purge last 3 wells on Site 3. They are taking bailers that BR-8 was poured from to purge, and will leave bailers in well for P. Riemersma + K. Davis to sample with.

0930: K. Davis + P. Riemersma prepared MW-31 bottles - this is sample for this AM

9-19-88

61

9-19-88

0945: Pulled sample from MW-31 after taking picture.

1000: Took gross parameter readings. Water very very cloudy; therefore we will allow to settle before attempting to filter.
temp.: 10.6 °C
pH: 7.82
sp. conductivity: 0.894 mS/cm (894 µmhos/cm)

1020: Prepared bottles for MW-28.

1035: Pulled sample from MW-28 after taking picture.

1100: Took gross parameter readings: Although water was only slightly cloudy, was very difficult to filter.
temp. 11.5 °C
pH 8.17
sp. conductivity 0.548 mS/cm (548 µmhos/cm)

1130: Prepared bottles for MW-35. We are taking a field blank, FB-12 here.

9-19-88

62

9-19-88

1145: Pulled sample from MW35 after taking picture.

1225: Gross parameter readings: Water slightly cloudy. We will filter after allowing to settle for ≅1 hour

temp. 15.1°C

pH 7.67

Sp. conductivity 0.236 mS/cm (236 µmhos/cm)

1300: Went back to office. J. Becker has returned. P. Riemersma & J. Becker started filtering the (3) Site 3 samples. K. Davis went to get lunch for some people. J. Hardeman & M. Raddy decontaminated (3) bailers used this morning using Decon-1 procedure.

Note: At 1200 K. Davis called Kathleen Kidd ~~notified~~ EPA to notify the lab of the inadvertent absence of BR-7 418.1 bottle. K. Kidd said to include it with a note in today's shipment.

Michael L Davis 9-19-88

63

9-19-88

1430: P. Riemersma & K. Davis went to get (2) 418.1 1 L Amber bottles from MW-27, Site 3 at J. Hardeman's request. Note: First started sampling this well ~~on~~ (MW-27) on 9-15-88. The bailer has been in the well since 9-15-88.

1445: Drove back to office to get labels.

1500: Drove to MW-2, Site 2. Prepared bottles.

1530: Pulled sample from MW-2 after taking picture.

1545: Took gross parameter readings. Water is like chocolate milk.

temp: 11.6°C

pH 7.06

sp. conductivity: 0.991 mS/cm (991 µmhos/cm)

1605: Pulled MW-1 after taking picture.

1625: Gross parameters (water same as MW-2)

temp 12.3°C

pH 6.93

sp. conductivity 1.131 mS/cm (1131 µmhos/cm)

9-19-88

1630-1730: Filtered MW-1 and MW-2. Began raining intensely (filtering was occurring indoors.

1745: Drove to Fed Ex with:

BR-8 site 3 parameters
MW-28
MW-31 } site 3
MW-35
TB-12 - taken at MW-35
MW-1 } site 2
MW-2
TB-8 - was supposed to be called "TB-9" since TB-8 was taken 9-16-88.

1800: J. Hardeman + M. Roddy decamped: bailers - Teflon, used Decon-1; Stainless, used Decon-2 - (Decon-1: page 11, Decon-2, page 59)

1830-1930: Made labels

1935: Left. Weather: Cloudy, warm, no breeze all day until 1700 when rained heavily until we left.

9-19-88

9-20-88

0710: Arrived

0735: Calibrated Orion pH probe described on page 8, lines 17-18.
7.00 standard: 7.01 → 7.00
4.00 standard: 3.98 → 4.00
Calibrated Hach conductivity meter described on page 8 lines 12-14.
1,000 µmhos/cm std: 1.000 mS/cm → [illegible]
Hach temp: 17.4°C Hg thermometer temp: 17.8°C

0800: J. Hardeman purged BR-9, bailer rinsate w/ site 2 purge

0830: Headed to Site 2, MW-37.
Sampling team: Lin Davis, J. Beeler.

0845: Pulled sample after taking picture.

0915: Took gross parameter readings.
Water very cloudy
temp 12. °C
pH 6.40
sp conductivity 0.362 mS/cm (362 µmhos/cm)

0930: J. Beeler sliced open finger while cutting bailer rope off of bailer (hands were numb from cold weather - 50°F, 20 MPH wind). M. Roddy took her to hospital.

9-20-88

9-20-88

0945: Regrouped. Sampling team is now P. Riemersma + K. Davis. We could not get lock back on MW-37. Decided to get longer brass lock from another well and switch due to MW-37 lock being too short. (Well cap is too tall to get outer casing flush in order to lock.) Left cap off of well; locked, will return later to remedy situation.

1000: P. Riemersma + K. Davis prepared bottles for 1015 sample of MW-41. However, when we were ready to sample, realized that Johann took off with keys to wells. Headed out to find keys.

1015: Borrowed keys from surveyors.

1030: Returned to well. Took picture, pulled sample from MW-41.

1105: Gross parameter readings:

Water is almost completely clear.

temp 9.8°C

pH 6.83

Sp. conductivity: 0.350 mS/cm (350 μmhos/cm)

K. Davis 9-20-88

9-20-88

Note: M. Rooley returned; J. Hardeman took J. Bache to hospital. Mike is now purging MW-46, within sight of Pete Riemersma + K. Davis.

1130: Prepared bottles for GW2E.

1150: Took sample from GW2E after taking picture

1205: Gross parameter readings:

Water very silty + cloudy

temp 9.7°C

pH 6.83

Sp. conductivity 1.388 mS/cm (1,388 μmhos/cm)

1230: LUNCH

1330 Placed calls to order supplies.

1400: Went to MW-40 to sample. Prepared bottles, ran back to office for supplies.

1500: Pulled MW-40 sample after taking picture. We are taking a duplicate, MW-55, at this well scheduled for 1530.

1545: Took gross parameter readings:

K. Davis 9-20-88

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9-20-58

Water is fairly clear.

temp 11.4°C

pH 7.66

sp. conductivity: 0.324 mS/cm (324 umhos/cm)

1600: Filtered metals and packed

1745: Want to Fed Ex with:

MW-37

MW-41

GW2E ~~and dup., MW-~~ KD

MW-40 and dup. MW-55

BR-9 using site 2 parameters

KD

1900: Left to go to Target to buy supplies.

Weather: 50-55°F, gusts of wind 20-30 MPH, cloudy

Note: Called K. Kidd @ 1700 to tell her to change "TB-8" from 9-19-58 to "TB-9". She said that the lab, today, broke ~~an~~ a still undisclosed number of amber bottles from "collapsing shelves in the refrigerator."

Kimberly L Dunn 9-20-58

69

9-21-58

0710: Arrived.

0715: J. Hardeman & J. Becker purged BR-10, using site 2 parameters.

0725: Attempted to calibrate Orion pH meter described on page 8, lines 12-18.

4.00 standard: Could only get down to 4.87

7.00 standard: Could only get down to 7.51.

(Poured fresh standards.)

Decided that this meter is shot.

Calibrated Hach conductivity meter described on page 8, lines ~~14-16~~ 12-14.

1,000 umhos/cm standard: 1.007 mS/cm → 1.000 mS/cm

Hach temp: 15.6°C; Hg temp 16.1°C

0830: Arrival at Site 2, GW2A. We will pull a duplicate here, MW-56. Sampling team is P. Rickerson & K. Davis. M. Reddy is purging MW-? within ~75' of our well. Prepared labels for this sampling event.

0845: Began pulling GW2A after taking picture. MW-56 is scheduled for 0915

Kimberly L Dunn 9-21-58

70

9-21-88

and we are also pulling a field blank, FB-13, scheduled for 0900.

NOTE: TB-10 has a giant bubble in one VOA vial.

0940: Took gross parameter readings. Water is cloudy.
temp: 12.0°C
pH 6.57
sp conductivity 0.456 mS/cm (456 µmhos/cm)

1010: P. Romero + K. Davis moved to next well, GW2C, site 2. Prepared bottles. We will be taking FB-14 at GW2C. FB-14 is scheduled for 1035.

1030: Took picture of bottles. Could not sample right away due to the presence of a big diesel truck idling about 40 feet east of GW2C. The truck left around 1035, but there is still a big USAF generator running continuously at the same approximate location. Sargent Denny

Kimberly L. Davis 9-21-88

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9-21-88

said that the exhaust was exiting on the other side of the ~~TACAN~~ TACAN facility about 75' east of GW2C.

1100 Took gross parameter readings:
Water very very silty
temp 11.2°C
pH: 6.10
sp conductivity 0.190 mS/cm (150 µmhos/cm)

M. Reddy is now acting as a go-between for P. Romero + K. Davis, delivering bottles to the office for J. Baker to filter.

1110: Moved to MW-1. Began preparing bottles.

1130: Took picture, then pulled sample.
1140 Took gross parameter measurements
Water very very silty.
temp. 11.3°C
pH 6.26
sp conductivity: 0.608 mS/cm (608 µmhos/cm)

Kimberly L. Davis 9-21-88

9-21-88

1200-1300: LUNCH

1300-1400: P. Riemersma + M. Reddy decontaminated stainless bailers (2) using Decon-2 procedure. Kim prepared bottles for this afternoon and placed phone call.

1400: Arrived at ~~MW~~ KIP GW2D, Site 2. Sampling team = JoAnn Sherman, who just arrived from Oak Ridge, and K. Davis. (M. Reddy + P. Riemersma are purging elsewhere on Site 2.) Prepared bottles

1415: Pulled sample for GW2D after taking picture. First picture, forgot nitrate bottle, so took another. J. Sherman took picture of site in general.

1500: Gross parameter measurements. Water pretty silty, but appears to be settling out O.K.

temp 10.7°C

pH: 6.09

sp conductivity: 0.875 mS/cm (875 µmhos/cm)

1520: Went to MW39. Prepared bottles

Kimberly L. Davis 9-21-88

9-21-88

1545: Pulled sample from MW-39 after taking picture.

1615: Took gross parameter measurements. Water fairly clear.

temp: 11.7°C

pH: 6.59

sp. conductivity: 0.659 mS/cm (659 µmhos/cm)

1620: Headed back to office. Had great difficulty filtering GW2D, so only sent 1 1/3 liters. JoAnn Beale called Kathleen Kidd to ask about this, and K. Kidd said to send 2/3 liter tomorrow.

1745: Headed to Fed Ex with:

GW2A and duplicate MW-56 (Site 2)

FB-13 taken at GW2A

TB-10

GW2C

FB-14 taken at GW2C

MW-4

GW2D

MW39

BR-10 with site 2 parameters.

Kimberly L. Davis 9-21-88

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9-21-88

1810: Returned to office. J. Sherwin prepared bottles for tomorrow. K. Davis helped P. Riemersma decon bailers. Teflon bailers were deconned using Decon-1 procedure and stainless steel bailers were deconned using Decon-2. (Decon-1 is described on p. 11 and Decon-2 is described on page 54.)

1900: Left.

Weather today: 50°F and cloudy in the AM, not much breeze, rising to 65°F and sunny in the afternoon.

9-21-88

75

9-22-88

0716: Arrived.

0730. K. Davis calibrated the Orion pH meter described on page 8, lines 17-18

4.00 standard: 3.23 → 4.00

7.00 standard: 6.98 → 7.00

Calibrated the Hach conductivity meter described on page 5, lines 12-19.

1,000 µmhos/cm std: 0.993 → 1.000 mS/cm

Hach temp: 23.9 Hg thermometer temp: 24.0

0830 J. Sherwin & K. Davis, sampling team, arrived at MW-7, Site 2 - (P. Riemersma & M. Roddy are purging elsewhere on Site 2.) Prepared bottles

0840: Left Site 2. J. Sherwin refused to work without application of insect repellant.

0850 J. Sherwin placed call to Robert Thoem, ES - Atlanta. He okayed the usage of insect repellant as long as it is not on the hands touching bottles.

0915: Returned to MW-7. Took picture and pulled samples.

0950: Took gross parameter readings. Water fairly clear.

9-22-88

76

9-22-xx

temp: 13.0°C

pH: 7.27

sp. conductivity: 0.748 mS/cm (748 µmhos/cm)

1030: Prepared bottles for MW-6. We will be taking a MATRIX SPIKE set here, scheduled for 1105.

1100: Took picture of bottles, then pulled sample from MW-6.

1130: Took gross parameter readings - Water is pretty cloudy.

temp 13.7°C

pH 7.07

sp. conductivity: 0.503 mS/cm (503 µmhos/cm)

1145: Prepared bottles for MW-5. We will be taking a field blank, FB-1S at this well, scheduled for 1230.

1200: Took picture pulled sample from MW-5.

1230: Took FB-1S.

1235: Took gross parameter readings. Water is typically cloudy, as are most non-ES wells.

[illegible] 9-22-xx

77

9-22-xx

temp: 12.7°C

pH: 7.40

Sp. Conductivity: 0.523 mS/cm (523 µmhos/cm)

1245: Prepared bottles for MW-38, Site 2.

1315: Took picture, then pulled sample from MW-38.

1335: Took gross parameter measurements. Water is clear, then got turbid as bailing continued.

temp: 13.7°C

pH: 7.61

sp. conductivity: 0.501 mS/cm (500 µmhos/cm)

1345: Finished up. Lack enough bottles to do next sample and Van has non-functioning starter.

1400: Jumped van. Headed to office

1415 - 1515 LUNCH

1530: Prepared CW2B bottles, site 2.

1545: Took picture then pulled sample from GW2B.

1615: Gross parameter readings: Water pretty clear towards end of filling up bottles.

[illegible] 9-22-xx

9-22-88

temp: 14.7°C

pH: 6.96

Sp conductivity: 1.081 mS/cm (1,081 µmhos/cm)

Note: TB-11, the travel blank: one of the 40 mL VOA vials had a large bubble in it.

Note: While sampling at GW2B, could detect a faint aroma of diesel fumes from the generator at the TACAN facility approximately ≈250 ft north of GW2B.

1700: John Hardeman resampled the EPA 418.1's for GW8C and MW8 which the lab broke 9-20-88.

1730: Headed to Fed Ex with

TB-11

MW-7, site 2

MW-6, site 2 with MATRIX SPIKE

MW-5 with FB-15, site 2

MW-38, site 2

GW2B, site 2

RESAMPLE: 418.1's for GW8C + MW8.

[signature] 9-22-88

9-22-88

1500: Returned to office. Prepared bottles and labels for next day.

1900: Cot'd.

Weather: Cool, cloudy, rainy mist on and off throughout day. High of ≈60°F.

[signature] 9-22-88

9-23-88

0710: Arrived. Prepared to do surface water sampling and sediment sampling (J. Hardiman, J. Beeler, K. Davis)

M Reddy & JoAnn Sherman are going to Site 10 to purge and sample the three wells there.

0745: Calibrated Orion pH meter described on page 8, lines ~~12~~ ~~14~~ 17-18.

4.00 standard: 4.26 → 4.00

7.00 standard: 6.95 → 7.00

Calibrated Hach conductivity meter described on page 8, lines 12-14.

1,000 µmhos/cm standard: .009 mS/cm (could not reduce to 1,000.)

Hach temp: ~~16.4~~ 17.6°C; Hg thermometer = 18.2°C

0810. Deconned (2) stainless steel buckets and (1) stainless steel auger using

(1) Liquinox scrub

(2) Potable rinse

(3) Methanol rinse

(4) HPLC water rinse.

This will be called "Decon-3" from here on.

[signature] 9-23-88

9-23-88

0845: Headed out to SL-5, a background surface water site

0900: Pulled SL-5 (sampling team = J. Hardiman, K. Davis & J. Beeler)

0925: Gross parameter measurements:

temp: 11.6°C

pH: 6.77

Sp. conductivity: 0.458 mS/cm (458 µmhos/cm)

0930: Drove to SL-4, a background site. We are going to take a duplicate here, called SL-25. John H. is taking stream flow measurements here using the Pygmy flowmeter. Note: He could not measure flow at SL-5; too stagnant.

0945: Pulled SL-4 sample.

1015: Pulled SL-25, Dup. (scheduled time)

1020: Gross parameter measurements:

temp: 10.2°C

pH 7.12

Sp conductivity 0.261 mS/cm (261 µmhos/cm)

1025: Took picture of SL-4 location.

1030: Went over to site 4, SL-11. J. Hardiman left. Sampling team = K. Davis + J. Beeler.

[signature] 9-23-88

9-23-88

1045: Pulled SL-11, Site 4.

1050: Gross parameter measurements:

temp 11.6 °C

pH: 6.46

sp conductivity: 0.401 mS/cm (401 µmhos/cm)

- Took picture of site SL-11.

Note - A strong odor of JP-4 was noted at this ~~site~~ [site] site, along with a oily sheen on the water surface.

1055: Went to SL-12, Site 4, approximately 100 yards east of SL-11 (upstream).

1100: Pulled SL-12 sample. J. Beeler took picture of K. Davis.

Gross parameter measurements:

temp: 12.9 °C

pH: 7.01

sp. conductivity: 0.396 mS/cm (396 µmhos/cm)

Note: Strong odor of JP-4 was noted here, but not quite as strong as SL-11.

There was also an oily sheen at SL-12.

The sediments at SL-11 + SL-12 were sticky and black, with strong odors associated with them.

[signature] 9-23-88

9-23-88

NOTE: After each sample, taken this AM, the stainless steel auger, bowl and spoon were cleaned using Decon-3 procedure described on page 80.

1200-1300: Lunch

1300: Prepared bottles for afternoon.

1330: Kathleen Kidd, ES-Berkeley called to say that (2) additional bottles were found in refrigerator breakage. Hg analyses had not been performed on 2 bottles DANGB-SGC4 and DANGB-DIW.

1400: Talked to Bill Hayden. Said that the DANGB-SGC4 was really for all the analyses not just Hg, so go ahead and sample SGC4.

Also, the EP Toxicity test will be for the 8 RCRA metals, then EP Toxicity the analyses # is 261.24.

Rest of afternoon: Packed samples, filtered. J. Bherini + M. Radly examined surface water sites and did flow measurements

[signature] 9-23-88

9-23-85

1730: Went to FedEx with:

SL-5 SB

SL-4 & dup., SL-25 SB

SL-11A

SL-12A

1500: J. Beeler + K. Davis prepared bottles for weekend's sampling, and cleaned, inventoried, packed supplies.

2400: Left.

Weather: Sunny & cool (high 60°F), breezy.

Richard L. Daw 9-23-85

9-24-85

0710: Arrived. Divided into 2 sampling teams. J. Shannon + M. Reilly are sampling background surface water sites SL-1, SL-2 and SL-3 with EB-16 and TB-12.

J. Beeler + K. Davis are going to start with Site 4 surface water sites.

J. Beeler decontaminated stainless steel buckets using Decon-3 (page 80).

0740: K. Davis calibrated Orion pH meter described on page 8, lines 17-18.

4.00 standard: 3.87 → 4.06

7.0 standard: 6.99 → 7.00

Next, calibrated Hach conductivity meter described on page 8, lines 12-14.

1,000 µmhos/cm standard: 1.003 mS/cm

Hach temp: 9.4°C Hg thermometer: 20.2°C

0840: K. Davis & J. Beeler prepared bottles for SL 13 (0900) and SL 26, dup, (0920).

Note: Due to the lack of water at SL-13, we moved SL-13 slightly west of [illegible]

Richard L. Daw 9-24-85

9-24-8[illegible]

is shown on map. This location is 15' east of drainpipe directly north of JP-4 holding tank # 3.

0900: Pulled SC-13. Did not take picture since we gave the camera to M. Roddy & J. Sharvin. Noted dead worms ~~at~~ two in stagnant water at surface water sampling location. This area is surrounded by cattails, which hinders the stream flow. Also, there is a heavy sheen on surface of water.

0920: Pulled SC-26 (scheduled time).

0945: Gross parameter measurements.

Water does not filter easily due to coarse floaty material.

temp. 10.3°C

pH: 6.63

sp. conductivity: 0.592 mS/cm (592 μmhos/cm)

0945-1030: Continued filtering. Very, very slow.

1030. Went back to office to try to call J. Hardiman to see if he accidentally went home to Georgia yesterday with crucial

[signature] 9-24-8[illegible]

9-24-8[illegible]

missing Pygmy meter part. (This part is still missing even though office was thoroughly inventoried last night.) Not listed in telephone directory, and could not get number.

1045: Headed to site SC-14, Site 4.

Note: The time on the bottles says 1000 although it will be 1100 before sampling.

1100: Pulled sample from SC-14. Water too shallow to get good samples, but took anyway. Very little flow.

1105: Gross parameter measurements:

temp. 11.9°C

pH: 6.94

sp. conductivity: 0.348 mS/cm (348 μmhos/cm)

1115 Poured FB-17, field blank.

1130: Headed to SC-15. Prepared bottles for SC-15. Pretty good flow, with deep water.

1200: Pulled SC-15 sample (Site 4)

1215: Gross parameter measurements:

temp.: 19.3°C

pH: 7.23

sp. conductivity: 0.667 mS/cm (667 μmhos/cm)

[signature] 9-24-8[illegible]

9-24-88

1245: Returned to office. Filtered, packed, lunch. J Shomo + M Roddy sampled (2) background sites SL-1 and SL-2.

1430: Returned to field. M. Roddy + J. Shomo went to get SL-3, a background site. K. Davis + J. Beeler went to site 8.

1445: Prepared bottles for SL-17, site 8 (K Davis + J. Beeler). M. Roddy had dug hole yesterday. We will try to sample water from this hole - Pulled sample at 1450

1505: Gross parameter measurements:

temp: 14.8°C

pH: 6.98

Sp. conductivity: 0.459 mS/cm (459 umhos/cm)

1520: Arrival at SL-18. M Roddy dug hole yesterday, but there is not enough water to pull sample. Therefore we will just pull sediment at 1530.

1530: Pulled sediment sample. Very difficult to dig. Did not take pH/conductivity measurement since we didn't take water sample.

1545: Labeled SL-19. Decided to pull duplicate, SL-27 scheduled for 1630.

1600: Pulled SL-19 sample.

K Davis 9-24-88

9-24-88

1615: Took gross parameter measurements

temp: 18.4°C

pH: 6.37

Sp. conductivity: 0.281 mS/cm (281 umhos/cm)

Water is especially dirty due to stirring up of sediments in shallow hole.

1625: Took field blank, EB-18

1630: Scheduled time for SL-27.

1632: Drove back to office. Realized that there was no way we would make the 1700 Fed Ex shipment. J. Shomo + M. Roddy had 2 boxes prepared containing:

FB-12 - background

EB-16, taken at background

SL-1, SL-2, SL-3 — no nitrates or rads went with these or metals except for SL-2 + SL-3

Went to Fed Ex with these.

1700: Continued filtering metals, packing

1800: J. Shomo + M. Roddy left

2100: K. Davis + J Beeler went to Duluth Airport Air Freight reception area with:

K Davis 9-24-88

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9-24-88

EB-17 taken at site 4

EB-18 taken at site 8

TB-13 - for site 8

SL14, site 4 (no metals yet)

SL13 + SL26, dup, site 4

SL15, site 4

SL17 site 8

SL18 (sediment only), site 8

SL19 + dup, SL27 site 8 (no metals yet)
and

SL1 metals

Also, J. Beeler prepared EP Tox bottles (3 1 L Ambers) to take back to Atlanta ES lab with her tomorrow.

Weather today: Morning, cloudy, cool, 60°F, gusts 20-30 MPH. Afternoon sunny, warmer 68°F, windy still.

2200: Left.

Kimberly R. Davis 9-24-88

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9-25-88

0730: Arrival (J. Beeler + K. Davis)

J. Beeler packed personal artifacts.

K. Davis sorted through chain of custodies and generally straightened up office.

0945: K. Davis took J. Beeler to airport.

1045: K. Davis returned from airport.

M. Roddy arrived. Went to sites SL-1 and SL-2 (K. Davis and M. Roddy) to take flow measurements with the Pygmy flow meter.

1310: Returned to office. Placed call to Base Security to get into site 5 to pull 4 samples. No answer. Note: Called earlier this morning and yesterday and also got no answer.

1330: K. Davis + M. Roddy went to Site 4 to resample SL-14 for metals since they were misplaced yesterday. Note: M. Roddy also resampled SL-1 and SL-2 metals while we were there today, since he accidentally filtered the ones gathered yesterday with a 5.0 μm filter instead of a 0.45 μm filter.

1400: K. Davis returned. Continued to pack.

Kimberly R. Davis 9-25-88

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9-25-88

1430: Began to rain. (This means no sampling tomorrow, possibly.)

1500: Mike left. & Davis stayed to pack. Nick found old SL-14, filtered.

2040. K Davis left.

Weather: Sunny, 60°F in AM, windy, drizzly & cloudy starting at 1400 and continuing towards 2100

[signature] 9-25-88

93

9-26-88

1200: K. Davis, who is keeping this log, came in late due to doctor visit.

Mike Riddy & J. Sherman came in earlier this A.M. and pulled the following samples:

SL-6 Site 2

SL-7 Site

SL-29 Dup. site 2

FB-20, site 2

1300: Mike R. & JoAnn S. went out to site 3 and pulled

SL 10 & dup. SL-28

1530: Called Kathleen Kidd (K. Davis)

Asked if:

- received air cargo shipment

- we should refilter SL-1 and SL-2 which were already sent with 5.0 μm filtering

She said she would call back. Also she verified that there is no way to resample BR-7.

Afternoon: K. Davis remained in office and filtered, packed

[signature] 9-26-88

9-26-88

1000: SL-10 and SL-29 (DUP) filtering extremely slowly.

1640: Talked to Kathleen Kidd. Send ~~[illegible]~~ for metals SL-1 and SL-2 with .45 μm filtration and clearly mark "refiltered." It is OK to send metals a day or two late. Check with PM on unfilterable samples. Also, ES Berkeley has not received air cargo shipment yet.

1750: Fed Exed out the following:

SL1, SL2, SL3 ~~[illegible]~~ Nitrates & Rad
SL7, SL6, SL29 (DUP) Nitrates site 2
SL8 site 3 (except for portion air cargoed) (no metals)
SL9 site 3 (no metals)
SL28 site 3 dup
FB-19 site 3
TB-14 site 3
SL1 + SL2-BG metals, refiltered
SL10 site 3 (except for portion air cargoed) (no metals)
SL6 site 2
SL7 site 2
SL29 Dup, site 2
SL14 site 4 metals
FB-20 site 2

[signature] 9-26-88

9-26-88

TB-15 Site 2

Air Cargoed:

All soils: SL7, SL8, SL9, SL28, SL10, SL6, SL7, SL29

SL-10 site 3 Ambers: EPA 418.1, 608, 625

SL8 VOA's

For all pH + conductivity + temp records for samples collected today, refer to "Sampling + Purge Records" Field Notebook.

1850: Mike R. + Jim Stemm left

1930: K. Davis left to send air cargo boxes (2) out.

Weather: Partly cloudy, cool 55°F. Around 1900, a heavy fog fell on airport which will cause the air cargo to arrive 9-28-88 since no planes can land or takeoff tonight.

Note: K. Davis called Berkeley lab around 1900 to see if air cargo shipment arrived. They said it just arrived but the person I talked expressed concern over "where we are going to put it."

[signature] 9-26-88

9-27-88

0710: M Reddy + J. Sherman arrived.
0730: K. Davis arrived.
M. Reddy + J. Sherman prepared bottles while K. Davis placed phone calls to Bill Hayden + J. Becker.
0830: J. Sherman left to check out of motel.
0845: M. Reddy + K. Davis went to Site 3 SL-10 to pull MATRIX SPIKE
0905: Took sample from Site 4, SL-16 (M. Reddy, K. Davis). Took picture.
0910: Gross parameter measurements.
Water is fairly muddy.
temp: 10.9 °C
pH: ~~11.0 (?)~~ 6.78
sp. conductivity: 0.455 mS/cm (455 µmhos/cm)
0945: Returned to office.
M. Reddy filtered, K. Davis packed.
NOTE: TB-16: One vial has a giant bubble in it.
1000-1400 M Reddy + J Sherman took 3rd round water level measurements
K. Davis filtered + packed.
[signature] 9-27-88

9-27-88

1430 M. Reddy took J. Sherman to airport. M. Reddy then sampled C4NGB-SGC4-, that EJ Berkey broke. Took duplicate.
1730: Went to Fed Ex with:
TB-16 (site 4)
SL-16 (no metals)
MATRIX SPIKE
SGC4 and dup (RESAMPLE)
M Reddy + K Davis then packed until 2300.
2300: Left.
Weather: Partly cloudy, cool (55 °F)

[signature]

[signature] 9-27-88

93

9-25-98

0700: K Davis arrived. Continued packing. Prepared SL-16 metals for Fed Ex. Prepared all instrumentation for Fed Ex.

0745: Called M. Joel Manns about disposal of trash. Got Captain Niemeyer.

0750: J Manns called back. Is sending men & truck.

0800: M Reddy arrived. Continued packing.

0845: K Davis went to Fed Ex with

(2) HNU's + OVA → U.S. Analytical
Biosensor explosives → T. Mustard
Explosimeter → Vol. Ann ton
Geiger counter + bellows → HAZCO
SL-16 metals → ES Berkeley

0910. Returned. Loaded boxes for air cargo. Took these

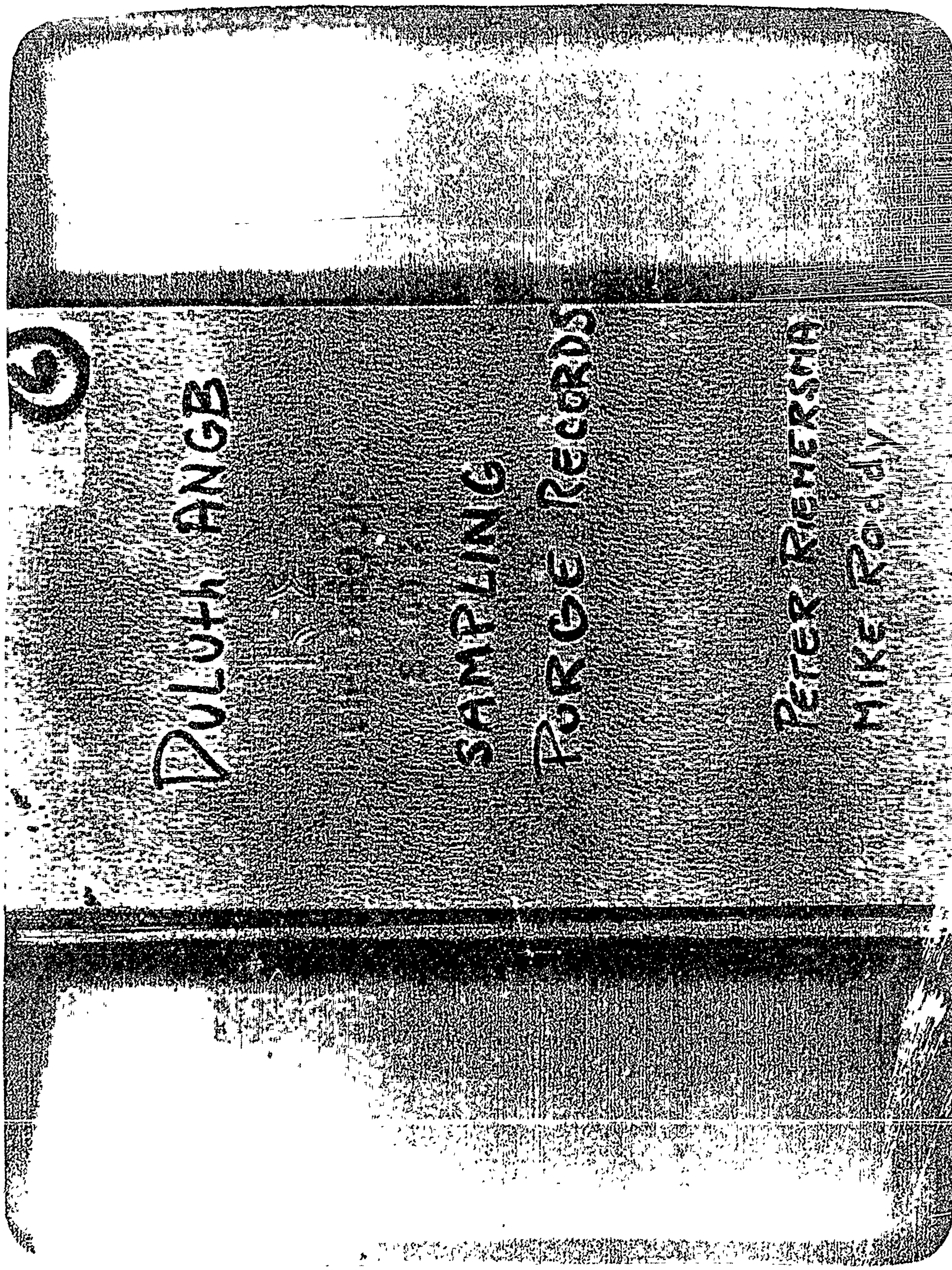
0930 Returned. Loaded seats into vans. Went to A.P.

1040: Left for Knoxville.

9-25-98

Q.2.6 Notebook 6, Sampling Purge Records

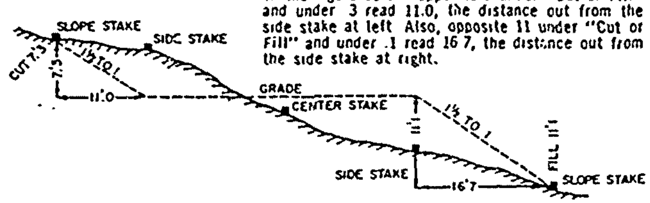
This notebook contains purge records for the monitoring wells. All wells were purged within the prior 24 hours of being sampled. The first entry is 7 September 1988 and the last entry is 28 September 1988. One hundred nineteen pages were used. The pages after page 61 are not numbered. Entries were made by Peter Reimersma and Mike Roddy; the pages are not signed.


DULUTH ANGB
SAMPLING
PURGE RECORDS

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under 3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	3.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1.	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30 8	30.9	31.1	31.2	31.4	20
21	31 5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60 6	60.8	60.9	61.1	61.2	61.4	40

KEUFFEL & ESSER CO.

For Curve Tables see end of book.

VI

Stabalization of purging Parameters

pH ± .1
conductivity ± 10 micromhos
temperature ± 1°C

1

1/7/88

7:08 Arrived at base, cool weather with blue sky

ES Personel

Mike Roddy
Peter Riemersma
Sharon Schultz
John O'brien
Jo Anna Beeler

PLAN Mike Roddy and Peter Riemersma are going to start purging back ground

Calibrate Meters

- Hnu meter calibrated Asset NO. 500791
Probe NO. 500018 Span setting 4.72
calibrated by Peter Riemersma

- Calibrated Cole Palmer conductivity meter
Model ~~9999-99~~ 1484-10 11 serial no. ~~8020 802116~~ 7092005
standard 1000 micromhos 960 - 1000
Standard 10,000 micromhos 9800 - 10,000

- Calibrate ORION Research Model SA 230 pH meter to 7.0 pH standard

2 9/7/88

adjust 7.06 to 7.00 with calibration Knob 9.76

adjust ~~9.2~~ to 10.0 with slope Knob

8-10:53 Prepared equipment for sampling

Went to Base Civil Engineering to pick up supplies, picked up purging supplies

Plan to do BG MW43 SE of FAA tower

BG MW 42 West of Site 3

BG MW 32 at Site 3

Load up van

11.24 Arrive at Background MW 43

HNU reading of borehole 3.5 ppm

Background 3.5 ppm

- water level reading to top of casing 13.12' TOC

- Bottom of well, no apparent 22.28'

silt on bottom

- Well volume calculation

22.28 - 13.12 = 9.16 water depth in well

~~9.16 x 1.63 = 14.93 gallons = 1 well volume~~

correction 9.16 x .163 = 1.493 gallons = 1 volume

3 volumes = 4.48 gal

Pump used Keck Geophysical Instruments

Sampling Pump 81

Serial NO 103

Model SP 81A

.166' 9/7/88 3

$\pi r^2 H$ 9.16 14.93

$\frac{\pi L 9}{36}$ $\frac{\pi}{4}$ = .76

9.16	14.93
1.63	3
2748	79
5496.0	
916.00	
14.9308	

11.43 Pump on, pump at surface water level, is being lowered as water level declines

11.45 Pump off water level at 13.5' TOC

Water sample taken at 11.44 at 2½ gallons purged.

pH 7.11 micromhos/cm

Temperature 12.8°C

conductivity 1075

Pump on 1150.26

Pump off 1150.40 1 gallon removed

12.12 Switch ph probe and recalibrate

calibrate to 7.0 adjust from ~~6.04~~ 6.9 to 7.0

calibrate to 10.0 adjust from 9.74 - 10.0

12.20 Pump on water level at 12.80 TOC

water sample taken for measurements - clear water

12.23 Pump off wt level 16.5'

pH 7.16

Temperature 14.9°C

conductivity 925

12.38 Change pH meter adjust 6.77 to 7.0

Use Serial 3191 adjust 9.89 - 10.00

9/7/88

1248 Pump on water level at 13.0

1252 Water sample, Pump off water level at 16.5

conductivity 940

temperature 13.6

SAS pH 6.90

ES Personnel working on this

Mike Roddy

Peter Riemersma

with instruction by Sharon Schultz

1320 Pump ON water level 13.16

1323 Pumpoff water level 16.5 sample taken

slight cloudiness

temp 13.9 °C

conductivity 960

pH 6.80

1332 Pump on water level ~~14.5~~ 13.5

water sample taken after 1 gallon discharge

total water withdrawn 3 gallons

temp 13.2 °C

conductivity 1050

pH 6.70

1355 Pump on Water level 13.4

13.58 Pump off Water level 16.5

temp 14.2

conductivity 1150

pH 6.52

9/7/88

1403 Recalibrate adjust 1125 to 1000

Conductivity meter

1406 Pump on water level ~~13.6~~ 13.50

1407 Pump off water level 16.5 4 gallons have been pumped

temp 13.6 ~~16.5~~

conduct ~~960~~ 1040

pH 6.63

1417 Pump ON w.t level 13.6

1418 Pump off w.t level 16.5 Purged 5 gallons

temp 12.7

conduct 1060

pH ~~6.73~~ 6.69

1435 take pump out of Background MW 43

1435-1724 Took Mike to town to pay ticket

Went to copy well logs at Base

Civil Engineering. Went to ~~P~~ try to find

Millers at Site 2 to get keys.

1724 Arrive at BG MW 42 HMF billions of mosquitos

Background Hnu 3.5 ppm

Borehole Hnu 3.5 ppm

initial water level before pumping to top of

casing 6.08 TOC

Team Members Peter Riemersma & Mike Roddy

9/7/88

9/7/88

Bottom of well 14.6
assume screen at 2-12
5.35 Took out one bailer full
water level at 7.02 no floating product visible
1 well volume = 8.52 X .163 = 1.39
3 well volumes = 4.17 gallons
5.40 PM water level 6.66 before bailer
sample taken
after 9 bailer samples taken 10.52 TOC
approximately 2 gallons of water withdrawn
conductivity 380
temp 12.9° C
pH 7.03
water looks to very slightly cloudy but
otherwise clear

6.16 water level before bailer 8.52
water level after bailer 9.92
total water withdrawn 2.75 gallons
water quality: very slightly cloudy.
conductivity 390
temp 12.1
pH ~~7.2~~ 7.18
No insect repellant used, Blood loss
sustained with severe mental anguish
9/7/88 Peter E Riemersma

9/7/88

6.45 water level before 9.0
water level after 10.26
took 1½ bailers out - total water withdrawn 3.0 gallons
water quality: very slightly cloudy
3' bailer - teflon conductivity 390
temp 11.9° C
pH 7.17

6.55 water level bef 9.62
water level after 10.40
total water withdrawn 3.5
water quality same as above
conductivity 400
temperature 11.6
pH 7.07

7.07 water level before 9.86
water level after 10.68
total water withdrawn 4.3 gallons
water quality same as above
conductivity 400
temp 11.4°C
pH 7.18
7.15 Leave site
7.30 Decon bailer used for NW 42
9/7/88 Peter E Riemersma

9/7/88

SUMMARY

1) PURGED BACKGROUND MW 43 FOR 2 hrs 54 minutes for removal of 3 well volumes (5 gallons)

2) PURGED BACKGROUND MW42 FOR 1 hour 43 minutes for removal of 3 well volumes (~4.3 gallons)
Conductivity, pH, and Temperature had stabilized as defined on page VI in front of this book

3) We decided to use bailer to purge due to slow recharge and easier ability to decon bailer between wells than the pump.

4) Mike Roddy and Peter Riemersma received instruction in purging parameters from Sharon Schulte. They worked on MW42 as a team.

9/8/88

PLAN FOR THE DAY
Peter Riemersma and Mike Roddy will Purge Background MW 32 at Site 3 and then purge 4-5 wells at Site 8

7.08 AM Arrive at office
Calibrate Cole Palmer conductivity meter
Model adjust 980 mmhos to 1000
adjust 9950 mmhos to 10,000
HNU ASSET NO 500791 calibrated per work plan
Calibrate Orion Research Model 5A 230 ph meter
adjust 6.97 to 7.00
adjust 9.73 to 10.00
Decontaminate Water-level indicator
Pick up bailer decontaminated 9/6/88
Prepare to move to BG MW 32
Mike Roddy and Peter Riemersma attended Health and Safety meeting
806 Have to go get Key to MW from Drillers at Site 2
8:30 Arrive at MW 32 Site 3
HNU reading background 3.8 ppm
HNU reading of casing hole 3.8 ppm
8:38 Initial water level before bailing 9.88'

10 9/8/88

btm of the well at 19.~~7~~72 good solid btm
total well water 19.72-9.88 = 9.84 feet
1 well volume = 9.84 x .163 = 1.60 gallons
3 well volumes is 4.81 gallons
can screened 7-17' can drop water
down to 14.5'

856 Took 4 bailer full out
859 water level after bailing 10.95
total water withdrawn 1 gallon
water quality: poor, very cloudy, no odor
conductance 2000 m
temperature 10.1°C
pH 7.25

Note. Cannot see btm of 150 ml beaker through water sample, note silt at btm of cup

904 initial water level 9.52 before
9.06 water level after bailers 11.5
water quality cloudy, same as above
total water withdrawn ~~2~~ 2.25 gallons
conductance 2000
temp 9.6°C
pH 7.50
Note. sediment in bottom of cup

9/8/88 11

923 initial water lvl 9.90'
924 final water level 11.0
water quality same as before
total water withdrawn 3.25
conductance 2000
temp 9.9°C
pH 7.34
Water still cloudy w/sediment

~~928~~ 929 initial wtr level 10.20
932 final H_2O lvl 11.71
water quality same as above
total water withdrawn 4.25 gallons
conductance 2000
temp 9.5°C
pH 7.31

939 initial wtr level 10.20
final H_2O 11.20
water quality same as above
total water withdrawn 5 gallons
conductance 2000
temp 8.9
pH 7.37

949 Leave site
950 Arrive at office to decon

bailer and water level indicator
per work plan procedure
1015 Arrive at HW15 Site 8
HNU reading of borehole after
recalibration of zero 0 ppm
1018 initial water level before ~~pumping~~ bailing 10.22 TOC
~~Final H2O level~~
total ~~water~~ withdrawn
btm of well 17.40
1 well volume = 7.18 x .163 = 1.170 gallons
3 well vol = 3.51 gallons
1024 final H_2O level 10.24 (water quickly recharged)
total water withdrawn 1 gallon
water quality: cloudy, some suspended sed.
conductance 320
temp 11.9
pH 6.97
Water cloudy, unable to see bottom of 150 ml
vial some sediment at bottom
1035 initial water level 10.24
1037 final water level 10.32
water quality same as before
total water withdrawn 2 gallons
conductivity 320
temp 11.7

pH ~~7.~~ 6.98
1042 initial H_2O wl 10.24
1044 final H_2O WL 10.32
Water quality same as before
total H_2O withdrawn 3.5 gallons
conductivity 320
temp 12.0 °C
pH 6.97
10.49 initial H_2O wl 10.24
10.52 final H_2O WL 10.28
water quality
total H_2O withdrawn
conductivity 350
temp 11.6 °C
pH 6.99
Note very rapid recharge - appears to reach
equilibrium height almost instantaneously
11.00 Back to office to decon
bailer and water level indicator
11.19 Arrived at HW 14 (Deep)
HNU of borehole 0 ppm
11.31 water level before pumping 9.50 TOC
btm of well 42.90, soft feel at btm.

9/8/88

1 well volume = 33.4 x .163 = 5.44 gallons
3 well volumes = 16.33 gallons

1130 Start bailing will bail ~ 4 gallons out

1140 final H_2O level 24.30
water quality slightly cloudy-~~clear~~ to almost
total H_2O withdrawn 4 gallons
conductivity 190
pH 8.35
temperature 9.6

Note Water looks clear with no apparent sediment. As always we are using a dedicated bailer line

1159 initial water lvl 21.12
1211 final water level 30.48
no odor — water quality cloudy, more cloudy than before
total H_2O withdrawn 7.0 gallons
conductivity 200
pH 8.84
temp 9.7

1224 initial water level 27.50
1232 final water level 33.76
water quality cloudy
total amt. water withdrawn 10 gal

9/8/88

conductivity 190
pH 8.62
temp 10.0

1241 Leave for lunch; wait for well to recharge ~~Back from Lunch~~
1324 Back from Lunch
1330 initial H_2O level 23.50
1339 final H_2O level 28.06
water quality slightly cloudy
total H_2O withdrawn 11.5 gallons
conductance 185
pH 8.60
temp 9.8

Note Can barely see bottom of 150 ml vial with water in it, no noticeable odor

1353 initial H_2O level 24.78
1402 final H_2O level 31.82
Water quality Same as above
total H_2O withdrawn ~~190~~ 14 gallons
conductance 190
pH 8.62
temp 10.0°C

1408 initial H_2O 30.44
final H_2O
water quality
total H_2O withdrawn

9/8/86

1408–1451 line to bailer fell off and Slope water indicator, which was below bailer, became stuck next to bailer at 37' as we tried to lift the slope indicator up. We tried to use a sling to bump the stuck bailer loose but were unable to do anything but push the bailer further down the well. Upon further attempts to unloosen it, the water indicator broke off at 5' and remains in the well. So, in summary, a 3 foot teflon bailer and the bottom 5' of the ~~slope~~ water indicator remain in the well. The indicator contains plastic and metal

1514 Went to office and picked up new bailer and water level measuring device

Move to MW17.

HNU of borehole 0 ppm

1526 initial water level before bailing 8.32

depth to btm. of well 14.76

1 well volume = 6.44 x .163 = 1.05 gallons

3 well volumes = 3.15 gallons

1533 Fin. final H_2O level 10.88

water quality cloudy

total amt of water withdrawn 1.5 gallon

9/8/86

conductivity ~~550~~ 540

pH 7.18

Temp 10.1°C

water looks cloudy with lots of sediment suspended

1539 initial water level 9.08

1541 final water level 10.95

water quality ~~sligh~~ somewhat cloudy

total amt water withdrawn 2.5 gal

conductivity 575

pH 6.88

Temp 9.4°

Water has small amount of clay sediment at the bottom

1553 initial water level 8.83

1556 final water level 10.78

water quality slightly cloudy

total amt of water withdrawn 3.25

conductivity 610

pH 7.13

Temp 9.4°C

1606 initial H_2O level 8.78

1609 final H_2O level 10.82

water quality slightly cloudy

total amt of water withdrawn 4.5 gallon

	conductivity	610
	pH	7.15
	temp	9.4

1612 Finish purging MW 17

17 Decontaminate 4 bailers, filter setup
17 and water level indicator per
work plan

1742 Go to bring seat to airport

1810 Leave office

SUMMARY

PURGE BG MW32

PURGE Site 8 MW 15

PURGE Site 8 MW 14 ~ 3 hours

PURGE Site 8 MW 17 ~ 1 hour

Dropped bailer down MW14 and broke lower 5' of line of water indicator off, also remaining in well

7:01 Am arrive at Office

Calibrate Cole - Palmer conductivity meter model 1484-10.

Adjust 990 mhos to 1000

Adjust 9600 mhos to 10,000

Calibrate Orion Research model SA 230 pH meter & thermometer

read 7.00 for 7.00 solution

Adjust 9.98 to 10.00

Calibrate temp reading

18.5 mercury thermometer read 18.5 on temperature readout on Orion Research model SA 230

HNU Model Assett 500791 calibrated to work plan specifications

7:39 Mike Roddy is going to scope out the surface water and soil sampling sites with Bob McLeod. Peter Riemersma is going to help with groundwater sampling.

7:39 - 9:< Help prepare equipment for sampling crew

9.00 Peter Riemersma is at Site 8 MW.16 to purge the well.

HNU of auger hole with cap removed previously by drillers.

9.24 depth to top of water before bailing 8.25' TOC

total depth of well = 32.64

1 well volume = 24.39 x .163 = 3.98 gallons

3 well volumes = 11.93 gallons

931 Final H_2O level 21.35

total water withdrawn 3.5 gallons

water quality slightly cloudy

conductance 350

pH 9.22

temperature 8.4 °C

now can see bottom of 150 ml vial with water in it

Slow recharge 947 Initial H_2O level 18.83

950 final H_2O level 21.40

total water withdrawn 4.5 gallons

water quality same as above

conductance 410

pH sas ~~7.90~~ 8.20

temperature 8.7

Dhane A. Schmidt took + recorded water quality measurements

953 Initial H_2O level 20.41

10 01 final H_2O level 23.31

total water withdrawn 5.5 gals

water quality same as above

conductance 410

pH 8.14

temp 8.9

10:10 Initial H_2O level 21.58

10:15 final H_2O level 23.38

total water withdrawn 6.5 gallons

water quality same as above

conductance 410

pH 8.21

temp 8.6 °C

Purging complete at 6.5 gallons as all parameters have stabilised and well recharges slowly. 6.5 gallons is about 1½ well volumes

10:36 Leave site MW.16

~~10.36~~ 11.22 Fray Decon bailer and water level indicator, try to get key

11.29 Arrive at MW23 Site 4

Had to skip previous MW at Site 8 because the keys were available

9/7/88

the bor monitor well lid was removed by drillers - reading by HNu of the borehole was 0 ppm

1131 initial water level before bailing 8.59
total well depth (soft btm) 36.00
~~final water level~~
~~total water~~
1 well volume is 27.41 x .163 = 4.47
3 well volume is 13.40

11.48 final water level 12.33
total water withdrawn 5 gallons
conductivity 1280
pH 7.46
temp 11.2
water quality: slightly cloudy
1153 initial H_2O level 9.63
1200 final H_2O level 12.75
water quality very slightly cloudy
total water withdrawn 9.5
pH 7.42
temp 10.5°
conductivity 1310

9/9/88

12.08 initial H_2O level 9.06
12.17 final H_2O level 12.02
water quality clear 14.5 gallons
total water withdrawn 14.5 gallons
pH 7.44
temp 10.8°
conductivity 1310
12.23 Leave Site 4 MW23 Purge complete
1223 - 1330 LUNCH and decon bailer + H_2O indicator
1331 GW8-C, previous well
Peter R, and Mike R. on it
borehole reading 0 ppm
1336 initial reading before bailing 7.76
btm of well soft at 19.50
~~final reading~~
~~water quality~~
~~total water withdrawn~~
1 well volume = 11.74 x .163 = 1.913 gal
3 well volumes = 5.74 gallons
1.44 final water reading 8.78
water quality slightly cloudy
total water withdrawn 1 gallon
pH 7.10
conductivity 9.0
temp 15.0°

1353 initial H_2O reading 8.00
1359 final H_2O reading 8.92
water quality cloudy
total amt water withdrawn 3.0 gallon
conductivity 980
temp 14.8
pH 7.04

1408 ~~1353~~ initial H_2O reading ~~8.00~~ 8.15
~~1359~~ final H_2O reading ~~8.92~~ 9.08
water quality clear to cloudy later
total amt water withdrawn 4.0 gallon
conductivity 990
temp 15.2
pH 7.08
Purge complete Go to office
Deconned bailer and water level
indicator per work plan

1433 Arrive at MN GW-8B
HNU of borehole 0 ppm
1436 initial water level 6.83
1518 final water level 7.62
Water quality so slightly cloudy
total amt H_2O withdrawn 2.5 gallons

conductivity ~~690~~ 700
temp 15.0
pH 7.34
bottom of well 21.83 soft feel at btm
1 well volume = 15 x .163 = 2.49 gallons
3 well volumes = ~~7.5~~ 7.48 gallons
Slow purging results from an inability to get bailer
past top of screen. We have only about
a foot of water to bail from.
Peter Kleinerisma asked to John Hardeman
who said the previous wells had two inch
screens. Bob McLeod explained how to
do stream flow measurements
2 inch?
across stream depth .6 to the water depth

1540 initial H_2O 6.95
final H_2O
water quality
total amt H_2O withdrawn
conductivity
temp
ph
1545 Abandon purge of GW-8B
due to slow recharge and inability

to get bailer below top of screen

~~16~~13 Arrived at Site 4 MW 22
HNU of borehole casing 0 ppm. windy
~~16~~15 top of water before bailing 9.59
bottom of well (soft) 36.45
1 well volume 26.91 x .163 = 4.39
3 well volume = 13.16 gallons

1628 final water level 25.25
water quality cloudy
total water withdrawn 5 gallons
conductivity 1270
pH 7.64
temperature 8.5°C

1643 initial water level 15.00
1657 Final water level 26.11
Water quality cloudy
total water withdrawn 18 gallons
conductivity 1250
pH 7.60
temperature 9.0

1722 initial water level 14.33
1731 final water level 25.02
water quality slightly cloudy
total water withdrawn 14
conductivity ~~1410~~ 1240
pH 7.72
temperature 8.5°C
Purge complete
1731-1844 Decon 5 bailers
Decon water level indicators
clean out van
We checked all bailers with HNU
and wrapped them up in aluminum
foil
1901 left office

Summary
Purged MW 16 Site 8
Purged MW 23 Site 4
Purged GW 8-C
Attempted to purge GW-8B

9/10/88

7.00 Am arrive on site

Calibrate Cole-Palmer conductivity meter model 1484-10

Peter Kumarma and Mike Roddy to purge Site 4 and Site 8 wells today.

Calibrate Orion Wescord model SA230 pH meter & thermometer

Serial # 3191

read 18.0 on thermometer and 18.0 on mercury thermometer

PER – Adjust 6 9.88 to 10

– Adjust pH 6.94 to 7.00

Calibrate Cole Palmer Model 1484-10

Serial No. 7092005

with 1000 std adjust 1550 to 1000

with 10,000 adjust 9050 to 10,000

– Calibrate HNU to standard isobutyl

• Asset 50071 ~~Probe No.~~ Span setting 4.74

739 Arrive at MW 21 Site 4

HNU reading of casing hole 0 ppm

bailers and water level indicators were cleaned near the end of yesterday

7.46 initial water level before bailing 7.58

depth to bottom of well (solid) 22.58

9/10/88

1 well volume is $15 \times .163 = 2.45$ gallons

3 well volumes is 7.34 gallons

initial H_2O level same as at 7:46

7.56 final H_2O level 9.48

water quality very cloudy

total water withdrawn 3 gallons

conductivity ~~220,000~~ 835

pH 8.58

temp 9.8

Water very cloudy with significant sediment

8.01 initial water level 7.99

8.06 final water level 10.25

water quality cloudy, better than before

total water withdrawn 5 gallons

conductivity 770

pH 7.16

temp 12.1

Good Recharge in this well

8.16 initial H_2O level 7.92

821 final H_2O level 10.11

water quality cloudy to slightly cloudy

total water withdrawn 7.5 gallons

conductivity 780

pH 7.24

9/10/88

temp 12.0

8.31 initial H_2O level 7.98
835 final H_2O level 9.74
water quality slightly cloudy
total water withdrawn 9 gallons
conductivity 780
temperature 12.7
pH 7.17
8.42 Leave Site
Decon bailer and water level indicator
Bailer Decon Procedure always used
SOAP
WATER WASH/Rinse
HNO_3
HPLC Rinse
Methanol
HPLC Rinse, thorough
Check with HNU

909 Arrive at MW 24 Site 4 in Tank Farm fence are
borehole HNU reading 0 ppm
916 initial water level before bailing 5.48
depth to bottom of well (Chard) 37.5
1 well volume 32.02 x .163 = 5.22
3 well volume = 15.65 gallons

9/10/88

936 final H_2O level reading 16.00
water quality clear
total water withdrawn 5 gallons
conductivity 600
temp 10.3
pH 8.32

928 initial water level 14.01
936 final water level 18.67
water quality slightly cloudy
total water withdrawn 9.5
Conductivity 750
temp 9.3
pH 8.46
Good recharge
945 initial water level 17.29
952 final water level 15.36
water quality slightly cloudy
total water withdrawn 12.5
conductivity 790
temp 9.0
pH 8.61

9/10/88

10.00 initial water level 9.57
10.07 Final water level 13.71
water quality slightly cloudy
total water withdrawn ~~15~~ 14.5 gallons
conductivity 790
temperature 10.0
pH 8.80

1012 initial water level 13.71
1014 final water level 1452
water quality almost clear
total water withdrawn 17.0
conductivity 840
temperature 8.6
pH 8 70

1018 initial water level 1432
1023 final water level 16.21
water quality almost clear
total water withdrawn 18.5
conductivity 760
temp 8.8
pH ~~8.8~~ 8.66
Note heavy sediment volume ~~probably~~
~~interfered with~~ consistent conductivity re.

9/10/88

1026 initial water level 15.30
1030 Final water level 17.51
water quality slightly cloudy
total water withdrawn 19.5
conductivity 770
temp 8.7
pH 8.72
1041 leave Site decon 1" bailer and water level
Arrive at GW-88 Site 8
1043 initial water level before bailing 7.07
total depth to bottom of well 21.83
from page 25 3 well volumes is 7.48 gallons
We now have 1 inch bailer to use down the
well since 2 inch bailer was unable to
go below top of screen

1118 Final H_2O level 9.85
water quality very cloudy
total volume removed 2.5 gallons
takes awhile to purge with 1" bailer
temp 11.3
conduct 630
pH 7.98

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1122	initial H_2O level	7.55
1129	Final H_2O level	9.03
	water quality	very cloudy, much sedim
	total water withdrawn	4 g
	conductance	670
	temp	11.9
	pH	7.57
1130	initial H_2O level	9.01
1143	final H_2O level	9.16
	water quality	cloudy
	total water withdrawn	6 gallons
	conductance	680
	temp	12.1
	pH	7.63
1144	initial H_2O level	9.14
1154	Final H_2O level	9.27
	water quality	cloudy
	total water withdrawn	7.75
	conductance	640
	temp	11.5
	pH	7.77

Note heavy sediment volume probably interfered with consistent conductivity measurements

9/10/88 35

1201	Leave site	
12:15 - ~~1315~~ 13:15	LUNCH	
1321	Arrive at GW8A Site 8	
	HNu reading of borehole = 0 ppm	
1323	initial water level reading before bailing	6.70
	btm of well (hard)	15.17
	1 well volume = 8.47 x .163 =	1.38
	3 well volumes =	4.14
1335	final H_2O level	8.75
	water quality	cloudy
	total water withdrawn	1.5 gallon
	conductivity	960
	temp	12.5
	pH	7.39
1336	initial H_2O level	8.36
1344	final H_2O level	10.12
	water quality	Cloudy
	total water withdrawn	3.5
	conductivity	1010
	temp	11.6
	pH	7.35

9/10/88

1349 initial H_2O level 9.02
1353 final H_2O level 9.92
water quality cloudy
total water withdrawn 4.5 gallons
conductance 1010
pH 7.41
temperature 11.4
Good recharge
1357 Leave Site
Decon bailer and water level indicator
1423 Arrive Site GW4-C Site 4
1429 water level before bailing 11.01
bottom of well (soft) 22.66
1 well volume = 11.65 x .163 = 1.9 gallons
3 well volume = 5.7 gallons
1442 final H_2O level 11.26
water quality
total water withdrawn 1.5 gal
conductance 1120
pH 7.94
temp 11.1

9/10/88

1444 initial H_2O level 11.15
1457 final H_2O level 11.27
water quality cloudy
total water removed 3.5
conductance 1120
temp 10.1
pH 7.86

1550 initial H_2O level 11.18
1510 final H_2O level 11.36
water quality very cloudy
total water removed 5 gallons
conduct 1110
temp 9.8
pH 7.79

1512 initial H_2O level 11.21
1519 final H_2O level 11.30
water quality
total water removed
conduct 1100
temp 9.4
pH 7.74
Peter R. goes to run errand for John Hardeman Mike Ruddy continues purging.

9/10/88

16 00 arrive at MW9 - site 4

HNU reading borehole 0 ppm

Mike Roddy top of water before bailing 7.13

bottom of well 15.60 → bottom hard

1 well volume = 8.47 x .163 = 1.38 gallons

3 well volume = 4.14 gallons

water level initial / final	total water withdrawn	water Quality	pH	Start Time / Final Time for bailing	Temperature	Conductance
7.13/12.20	1 1/2 gallon	Very cloudy	7.04	16:14/16:20	14.0	860
8.34/12.08	2 1/2 "	very cloudy	7.04	16:45/16:49	14.1	850
8.37/11.83	3 1/2 "	Very cloudy	7.05	17:16/17:20	13.6	850
8.76/11.92	4 1/4 "	very cloudy	6.95	17:41/17:44	13.5	850

note: Slow recharge

17:50 leave site

17:58 - 18:25 Decontaminate field gear

18:25 - 18:45 Discuss what needs to be done

18:45 leave office

Summary

Purged MW21, MW24 } site 4
GW4-C, MW9 }

GW-8B, GW-8A } Site 8

9/11/88

10:00 Peter Riemersma and Mike Roddy arrive at site to purge additional wells. Windy clear blue skies. JoAnna and Kim arrived earlier to do bailer rinsate.

Calibrate Cole Palmer Conductivity meter Model 1484-10 S/N 7092005
adjust 1075 to 1000
adjust 9600 to 10000

Calibrate Orion Research model SA 230
temperature calibrated with mercury therm.
Adjust pH 6.90 to 7.00
pH 9.91 to 10.00

Calibrate HNU 5000791 per work plan
same as yesterdays calibration procedure

9/11/88

10:25 arrive at GW40

HNU reading of borehole → 0 ppm

top of water before bailing 10.67

bottom of well 26.08 soft mushy feel

1 well volume = 15.41 X .163 = 2.51

3 well volumes = 2.51 X 3 = 7.53

Note well has apparently suffered some frost heave

Water level initial/final	total water withdrawn	water quality	pH	bailing start time / finish time	Temp °C	Conductance mhos
10.67/11.75	2 gal	very cloudy	6.49	10:36/10:54	9.2 °C	760 mhos
11.32/11.67	4 gal	very cloudy	6.46	10:57/11:08	8.3	850
10.98/11.58	6 gal	very cloudy	6.30	11:17/11:30	8.5	880
10.83/11.52	7.5 gal	very cloudy	6.48	11:40/11:51	9.2	890
11.36/11.54	8. gal	very cloudy	6.40	11:56/12:01	8.8	900

note: good recharge

finish 12:04

leave site 12:06

Decon sampling apparatus 12:10 - 12:23

9/11/88

12:29 arrive at GW4-B

HNU reading of well → 0 ppm

top of water before bailing - 6.21

bottom of well - 23.29 mushy bottom

1 well volume = 17.08 X 0.163 = 2.78

3 well volumes = 2.78 X 3 = 8.34 gallons

12:41 - 13:50 help get Silver Van unstuck

Water level initial/final	total water withdrawn	water quality	pH	bailing Time start/finish	Temp °C	Conductance
6.21/12.75	3 gal	very cloudy	8.12	13:54/14:12	11.2	370
11.6/12.33	5 gal	very cloudy	8.38	14:16/14:26	10.4	360
10.58/11.55	7 gal	very cloudy	8.18	14:33/14.43	9.8	380
8.75/9.16	8½ gal	very cloudy	8.06	14:49/14.56	9.7	390

finish 14:59

leave site 15:05

lunch 15:18

16:09 back from lunch - decon sampling equipment 16.24

10:32
arrive at MW-11

HNU reading at well → 0 ppm

initial water level reading before bailing 8.19

bottom of well 16.68 → hard bottom

1 well volume = 8.49 × 0.163 = 1.38

3 well volumes = 1.38 × 3 = 4.15

note PVC well casing

	water level initial/final	total water withdrawn	water quality	pH	Bailing start Time/finish time	Temp °C	conductance mmhos
11	8.19/10.16	1½ gal	partly cloudy	7.35	16:42/16:49	13.0	640
10	10.10/12.31	2¾ gal	partly cloudy	7.17	16:52/16:58	11.9	640
11.	11.33/13.08	3¾ gal	partly cloudy	7.36	17:27/17:30	11.9	640
11	12.08/13.67	4¼ gal	partly cloudy	7.25	17:53/17:56	11.6	630

finish 17:59

18:03 leave site

Decon sampling equipment 18:07 - 18:17

18:18 arrive at GW4-A

HNU

initial water level reading before bailing 5.36

bottom of well 21.00 mushy bottom

1 well volume = 15.64 × 0.163 = 2.55

3 well volumes = 2.55 × 3 = 7.65

Water level initial/final	total water withdrawn	water quality	pH	Bailing Time Start/finish	Temp °C	Conductance
5.36/5.70	3½ gal	cloudy	6.74	18:29/18:42	10.9	650
5.48/5.75	6 gal	cloudy	6.61	18:46/18:54	10.3	650
5.58/5.80	8 gal	very cloudy	6.61	18:56/19:05	9.9	650

Finish 19:10

Decon sampling equipment 19:12 - 18:10

leave site 18:12

Summary

Purged GW4-D, GW4-B, GW4-A MW 11.

9/12/88

Arrive 7:00 AM Discuss day plans, raining outside.
Sampling slow due to long filtering of water

- Calibrate Cole Palmer conductivity meter same as yesterday
  - adjust 1050 to 1000
  - adjust 9400 to 10,000
- Calibrate pH meter ORION research model SA 230
  - adjust 6.90 to 7.00
  - adjust 8.85 to 10.00
- Calibrate HNU 500791 per work plan
  - Probe 500018 Span setting 4.34

7-845 Pick up Coolers at Base

8:45 8 Arrive at Site 4 MW8
Btm of well (soft) 15.58
1 well volume = 8.5 X .163 = 1.385
3 well volumes = 4.16 gallons
HNU of borehole 0 ppm.
Peter Riemersma and Mike Roddy on the purge team. Kim Davis and JOANNA on sampling.

945 Leave Site MW 8
decon bailer and water level indicator

water level initial/Final	Bailing TIME start/Finish	total water withdrawn	water quality	pH	Temp	Conductivity
7.08 / 10.48	8.58 / 9.04	1.5 gallon	very cloudy	~~7.9~~ 7.85 *	13.7	405
8.33 / 10.30	908 / 913	2.5 gallon	very cloudy	~~6.7~~ 6.36	13.4	410
7.99 / 9.72	919 / 924	4.25 gallon	very cloudy	6.30	13.4	400

PURGE complete

* recalibrated pH meter from 7.45 to 7.00

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9:45–1202 Shopping for supplies, bought pocket Knives, twine

When we come back JOANNA and Kim say that Enrique from MPCA came by and wants to sample MW29 at Site 3

1208 Arrive at MW29 Site 3
HNU reading of casing hole 1 ppm
14.64 = ~~First~~ depth to bottom of well
1 well volume = 7.97 x .163 = 1.3 gallons
3 well vol = 3.9 gallons
Well purge

1240 Leave MW29
Go to Fed Express to drop off packages for Kim and JOANNA

1255–1345 Lunch

9/12/88 Site 3 MW29 47

Water level Initial / Final	Bailing Time Start / Finish	total water withdrawn	water quality	pH	Temp	Conductivity
6.67 / 7.07	1220 / 1223	2.0 gallons	almost clear	7.00	15.7	~~1800~~ 615
7.02 / 7.30	1225 / 1229	3.5 gallons	almost clear	6.96	15.1	~~1800~~ 615
6.76 / 7.56	1233 / 1234	5.0 gallons	almost clear	6.89	15.5	610

Purge Complete

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9/12/88

13:59	Arrive at Site 4 MW 27
	Hnu of casing entrance 0 ppm
initial W.L. before bailing	depth to btm of well 13.62 (14.62)
7.19	1 well volume = 6.43 x .163 = 1.05 gal
	3 well volume = 3.15 gallons
1454	Stop purging MW27, slow recharge prohibits extensive sampling for State and HAZWRAP we will return to purge at a later time
1512	Arrive at MW25 Site 4 for purging
	Hnu of Borehole 0 ppm
	btm of well at 18.84
	1 well volume = 11.65 x .163 = 1.9 gallons
	3 well volumes = 5.7 gallons
	Purging info on btm of chart on next page (MW25)
1532	Enrique Gentzsch watching us purge
1615	Leave Site MW ~~27~~ 25
	Try to return seats in van again

9/12/88

	Water level initial/Final	Bailing Time Start/Finish	total water withdrawn	water quality	pH	Temp °C	Conduct micromhos/cm
MW27	7.19 / ~~13.62~~ 11.62	1405 / 1412	1 gall	very slightly cloudy	~~6.52~~ 6.19	13.3	490
	pt ~~9.45~~ 9.42						
	~~10:06~~ pt						
MW 25				MW25			
	7.76 / 13.42	15:17 / 15:21	2.5 gal	slightly cloudy	7.13	13.4	670
	9.83 / 12.50	15:36 / 15:40	4.0 gal	slightly cloudy	7.22	13.1	650
	10:06 / 12.70	~~15:44~~ 15:54 / 1556	5.0 gal	almost clear	7.19	13.1	645
	11.17 / 13.16	1603 / 1607	6.0 gallon	almost clear	7.23	12.8	645

1801 Leave office for the day

7:10 AM Arrive at office. Since ~~we~~ purgers are a head of samplers, M. KeIR and Peter R. are going to do important errands until Kim D. and JOANNA complete sampling source additional wells.

Calibrate Cole Palmer — meters same as yesterday

adjust ~~99~~ 1060 to 1000

adjust 9400 to 10,000

Calibrate ORion Research model SA 230

adjust 6.57 to 7.00

adjust 9.59 to 10.00

Calibrate HNU model Asset No. 5000791 per work plan

Run errands consisting of ~~picking up Fed Ex~~ dropping off Fed Ex package, picking up bubble pack, Call up Oak Ridge

Office

Initial water level	8.26	well volume calculation on page
~~total~~ well depth ~~final water level~~	16.68	
3 well volumes is	4.15	

Peter R. Went to Fed X to get Hermit of John O'Briens properly labeled and packaged since it was unable to go out yesterday in its labeled condition.

MW11

9/13/88

MW 11 water level initial/final	bailing time start/finish	total water withdrawn	water quality	PH	Temp	conductivity
MW 11 8.26/10.0	1043/10:48	1 gallon	cloudy	7.18	12.1	630
9.61/11.47	11:11/11:16	2 gallon	very cloudy	6.88	11.3	640
10.93/12.60	1152/1156	3.5 gallons	very cloudy	6.98	11.8	650
12.06/13.74	1205/1209	4.5 gallon	very cloudy	7.02	12.1	640
MW4A		MW4A				MW4A
5.41/6.32	1250/1257	3 gallons	very cloudy	7.01	12.4	690
5.60/6.08	1301/1306	5 gallon	very cloudy	6.80	11.7	640
5.78/6.0	1307/1314	7.7 gallons	very cloudy	6.85	12.3	640

9/13/88

12:14 leave MW 11 Site 4

12:36 Arrive at Site 4 ~~MW~~ GW 4A

total depth of well 21' muddy

3 well volumes from previous calculation 7.65 gall

MW4A purge info on left of this page

13:20 leave site - drive back to office

13:30 lunch

14:20 back from lunch

14:23 - 14:48 decon

55

water level initial/final	Bailing time start/finish	total water withdrawn	water quality	pH	temp °C	conductivity umhos	GW4D
10.67 / 11.86	14:53 / 15:08	2½ gallon	cloudy	6.50	9.3	860	
10.82 / 11.75	15.12 / 15.26	5 gal	cloudy	6.13	8.5	920	
11.45 / 12.02	15.30 / 15.40	6½ gal	cloudy	5.57	8.8	980	
11.33 / 11.98	15.41 / 15.50	7 gal	cloudy	6.46	8.4	990	

MW10

water level initial/final	Bailing time start/finish	total water withdrawn	water quality	T	pH	conductivity	MW10
6.00 / 6.12	16:30 / 16:41	1½ gal	cloudy	16.8	7.05	600	
6.09 / 6.10	16.43 / 16:48	3 gal	cloudy	16.1	6.62	530	
6.08 / 6.12	16:51 / 16:56	4½ gal	cloudy	16.4	6.53	530	

9/13/88

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9/13/88

14:51 arrive at GW4-D
HNU of well → 0 ppm
initial water level 10.67
bottom of well 26.08 soft mud bottom
1 well volume = 15.41 × .163 = 2.51
3 well volumes = 2.51 × 3 = 7.53

15:58 finish leave site
16:04 Decon
16:18 finish Decon
16:26 arrive at MW10
HNU of well → 0 ppm
initial water level reading 6.00
bottom of well 15.16 firm bottom
1 well volume = 9.16 × 0.163 = 1.49
3 well volume = 1.49 × 3 = 4.47

Note No lock on well.
PVC well.

17:00 finish leave site
17:08 arrive back at Decon area
begin decon
17:54 finish decon

9/13/88

18:10 prepare bottles for next day
18:38 leave site

Summary for the Day

Purged MW-11
GW4-D
MW-10

9/14/88

7:10 AM Arrive at Site

Calibrate Conductivity meter - Cole Palmer
Model 1484-10 Serial No. 7092005
adjust 1100 to 1000
adjust 9500 to 10,000

Calibrate pH Meter Model SA 230
Serial No. 3191
adjust temperature with thermometer
adjust 6.98 to 7.00
adjust 9.88 to 10.00

HNU calibration Asset No. 500791
Span setting 4.82

7:30-930 Mike R. and Peter R do BR-6
bailer rinseate samples
949 Mike R and Peter R arrive at Site 3.
Mike R is going to do MW26
Peter R is going to do MW25
these are paired wells
MW25 From previous calculation 3 well volume = 5.7 gal
MW26 ~~for~~ btm of well at 15.33
1 well volume = 7.96 x .163 = 1.30

MW 25 (Peter Richmond)

water well level initial/final	Bailing time start/finish	total water withdrawn	water quality	pH	temp	conductivity
~~7.37~~ 7.87 / 10.51	~~9:53~~ 10:01 / 10:12	1.5 gallon	slightly cloudy	7.69	12.8	635
9.95 / 10.15	10:19 / 10:22	3.0 gallon	slightly cloudy	7.33	12.0	630
10.33 / 14.25	10:29 / 10:35	4.0 gall	cloudy	7.30	12.8	640
11.0 / 15.92	10:53 / 10:58	6 gal	cloudy	7.35	12.8	650
MW 26 (Mike Roddy)			MW-26			
7.37 / 7.43	9:53 / 9:59	1 1/2 gal	partly cloudy	7.25	14.1	450
7.38 / 7.49	10:08 / 10:12	3 gal	partly cloudy	6.82	14.4	450
7.38 / 7.47	10:17 / 10:24	5 gal	partly cloudy	6.73	14.2	440

Purge Completed

MW-26

HNU ~~of~~ well → 0 ppm

initial water-level reading 7.37

bottom of well = 15.33

1 well volume = 7.96 x 0.163 = 1.30

3 well volumes = 3 x 1.30 = 3.90 gal

11:00 - 1215 Decon 2 2" bailers, one for the purge team and one for the sampling team. Decon 1 1" bailer for the sampling team. Wait for phone call ~~at~~ from lab about accident as described in Kim Reno sampling fieldbook on this date and time. This information is needed to plan our sampling strategy for the afternoon.

1215 - 1327 Talked to Milane at the Berkley Lab. They had a wheel break on a cart and some bottles were broken. Some wells ~~samples~~, though some bottles were broken, the lab will be able to get by with what they have. However for MW29 sampled 9/12/98 and GW4C sampled

15.33
7.37
7.96

60 9/14/88

9/11/88 several bottles were broken and these wells need to be re-sampled. Listed below are the bottles that had to be refilled. I talked to Bob McLeod who said we should re-sample for only those bottles broken. He also said to call Richard Westmoreland about the state only sampling VOAs at MW29.

DANGB-4-GW4C-GW1 5 VOA vials
DANGB-3-MW29-GW1 2 418.1 liter bottles
2 1 liter bottles 608
2 1 liter bottles for 625
DANGB-FB9 2 VOA bottles

1327-1505 ~~Bog~~ Went on supply buying errand and bought vermiculite for packing samples
tweezers for removing filter paper
gallon zip lock plastic bags for shipping
1000 feet of bailer nylon rope

1505-1549 Lunch Break

1549 Arrive at MW29
HNU of borehole 0 ppm
3 well volumes from page 46 = 3.9 gallons

9/14/88 MW29 61

water level initial / final	Bailing time start / finish	total water withdrawn	water quality	pH	conductivity	temp
6.75 / 7.20	1553 / 1557	1 gallon	slightly cloudy	6.86 ~~7.79~~	680	17.7
6.82 / 7.34	1603 / 1606	3 gallons	almost clear	6.51	730	15.9
6.91 / 7.34	1609 / ~~1611~~ 1611	4 gallons	slightly cloudy	6.50	740	16.0
MW27			MW27			
8.50 / 12.37	1642 / 1644	1 1/4 gallons	slightly cloudy	6.53	580	15.0
11.00 / 12.05	1729 / 1732	3/4 gal	slightly cloudy	6.92	600	12.2
11.83 / 13.50	1752 / 1756	2 gal	cloudy	7.08	610	11.5

MW27

note very slow recharge

9/14/88

Note from 1215 - 1327 I talked to Melanie at the Berkley Lab about not analyzing MW26 as it had been ~~incorrectly~~ accidently sampled from an unpurged well.

1635 Arrive at MW27 Site 3
HNU of borehole 0 ppm
btm of well 14.68
3 well volumes is 3.15 gallons from calculations on page 48
Purge parameters on page 61
This well recharges very slow and it is taking quite a bit of time to get even 3 gallons out

1802 Leave MW27
decon bailers

1845 Leave office

9/15/88

7.20 Arrive at office partly cloudy & Kim
Kim Davis
Peter Rasmussen
JoAnna Beeler
Mike Roddy
- Mike R. calibrate Hnu Asset 50006
span setting 4.28
- Calibrate Cole Palmer Conductivity meter Serial No. 7092005
adjust 1075 to 1000
adjust 8060 to 10,000

- Orion Research PH meter model SA 230
adjust 6.60 to 7.00
9.90 to 10.00
temperature checked

730-954 Found out that we have to send insurance forms for auto accidents to CNA office in Minneapolis
I ~~We~~ wrote our local and Oak Ridge office numbers as contact points. We sent one copy of the accident reports Fed X to Coultt Palmertree and one copy (the original) by first class US mail

9/13/88

15.15 arrive at MW 33, ~~37~~ 34

MW ~~33~~ initial H_2O level 9.41 TOC

bottom of well 14.82 hard bottom

1 well volume = 5.41 x .163 = .88

3 well volume = 0.88 x 3 = 2.64

HNU of well 33 → 0 ppm

MW 33 initial H_2O level 9.25 from TOC

bottom of well 24.80 hard bottom

1 well volume = 13.55 x .163 = 2.2

3 well volumes = 2.2 x 3 = 6.6 gal

HNU of well headspace → 0 ppm

MW 34 is very slow recharge

MW30 Hnu of borehole ~ 0 ppm

water level before bailing 9.38

btm of well 17.92

1 well volume = 8.54 x .163 = 1.39

3 well volumes = 1.39 x 3 = 4.17

9/15/88

14.82
9.41
5.41

MW 30

water level initial / final	bailing time start / finish	total H_2O content	water quality	pH	Temp °C	conductance
9.38 / 12.76	17:38 / 17:42	1 3/4 gal	cloudy	8.12	9.3	450
11.35 / 13.50	17:53 / 17:55	3 gal	cloudy	8.03	9.2	460
11.50 / 12.98	18:09 / 18:10	4 1/4 gal	partly cloudy	7.92	9.1	470

purge complete

18:18 leave site

18:25 - Decon sampling equipment

19:25 leave office for the day

9/15/88

to CHA
P.O. Box 9332
Minneapolis, MN 55440
ATTN Claims dept
We picked up FED X packages
including bailers and forms on how
to do stream flow measurements

10:51 1039 pick up boxes for base supply

11:44 arrive at GW4C
HNu at above 1L → 0 ppm
initial water level measurement 11.08
bottom of well 22.66 muddy bottom
1 well volume = 11.58 X 0.163 = 1.9
3 well volumes = 1.9 X 3 = 5.7

12:42 finish up leave GW4-C

12.42 - 1.30 PM LUNCH.
1.30 - 3.10 PM decon stainless steel bailers
pick up coolers from Base supply

1522 Start bailing MW34

9/15/88 mw

GW4C

Water level initial/final	bailing time Start/finish	total water withdrawn	water quality	pH	Temp °C	Conductance
11.08/11.35	11.59/12.04	1 3/4 gal	slightly cloudy	7.47	10.9	1240
11.24/11.32	12:07/12:19	4 gal	slightly cloudy	7.63	10.6	1190
11.25/11.48	12:24/12:38	6 gal	slightly cloudy	7.60	10.6	1180
	purge completed					

M-W-33 (Peter Rienersma) MW33

water level initial/Final	Bailing time Start/Finish	Total H2O Withdrawn	water quality	pH	Temp	Conduct
9.25/14.80	15:39/15:46	1 1/2 gal	cloudy	7.33	8.9	1500
14.30/18.30	15:49/15:53	3 1/2 gal	cloudy	7.48	8.3	1510
16.50/15.90	15:57/16:02	5 gal	cloudy	7.49	8.2	1580
15.80/19.15	16:03/16:07	6 gal	cloudy	7.46	7.9	1650
Ev.						

MW 34 (Mike Roddy)

water level initial/finish	bailing time Start/finish	total H2O withdrawn	water quality	pH	Temp	conduct
9.41/12.02	15:22/15:25	3/4 gal	clean			
11.00/13.02	15:31/15:33	1 1/4 gal	slightly cloudy	7.28	10.3	420
11.04/13.42	16:09/16:10	1 3/4 gal	cloudy	7.72	9.3	540
11.71/13.42	16:34/16:35	2 1/4 gal	cloudy	7.45	9.5	610
11.75/13.62	17:10/17:10	3 1/2 gal	slightly cloudy	7.44	9.7	740
11.78/12.33	17:24/17:24	2 3/4 gal	slightly cloudy	7.51	9.6	730

9/16/88

7:05 AM Arrive at office, weather is rainy and it rained all night

- Cole Palmer Conductivity Meter
  model 1484-10 S/N 7092005
  adjust 1260 to 1000
  adjust 9500 to 10,000
- ORion Research PH meter model
  SA 230 Serial NO. 3191
  adjust PH 6.96 to 7.00
  adjust PH 9.66 to 10.00
- Calibrate HNU Asset NO. 500791
  Probe NO. 500018 to 97% isobutylene
  Span setting 4.28

PLAN

Kim Davis and Peter Riemersma are going to sample GW4-C at Site 4
Mike Roddy and John Hardeman are going to purge some wells
Johann Beeler is leaving on a plane at 10:40 this morning

9/16/88

0800 - 845 do bailer rinse sample
0855-0935 help set up sampling station
0940 - 10:10 run errands for samplers and hold down tarp

10:30 arrive at Site 3
GW3-C Initial water level 8.50
Bottom of well 21.33
HNU of well
1 well volume = 12.83 x 0.163 = 2.04
3 well volumes = 2.04 X 3 = 6.12

GW3-B
Initial water level 10.20
Bottom of well 22.0
HNU of well
1 well volume = 12 X .163 = ~~1.2~~ 1.9
3 well volume = 1.9 x 3 = ~~5.4~~ = 5.7

9/16/88

11:00 - go back to office to help samplers - decon bailers

13:00 Go to lunch
14:05 back from lunch
Decon filtering devices
help samplers

15:18 GW3-A
initial water level 10.30
bottom of well 18.33
1 well volume = 8.03 X 0.163 = 1.3
3 well volume = 1.3 X 3 ≅ 4 gal

water level Initial/final	Bailing Time Start/Finish	Total water purged	water quality	pH	Temp °C	Conductance mmhos	well
8.50 / 19.0	11:29/11:33	2 gal	very cloudy	7.35	9.4	300	GW3C
11.92 / 17.33	16:22 / 16:25	3¼ gal	very cloudy	7.82 ~~8.05~~	9.2	420	
15:10 / 20.02	18:18 / 18:20	4½ gal	very cloudy	7.64	9.2	440	
9/16/88							
10.20 / 11.6	10:52/10:58	2 gal	very cloudy	7.53	10.2	700	GW3B
11.3 / 12.4	11:04 / 11:07	4 gal	very cloudy	7.49	10.1	700	
10.85 / 11.4	11:16 / 11:20	6 gal	very very cloudy	7.46	9.7	700	

purge completed

9/16/88

15:28 arrive at GW3-D

HNU of well - n.d. done rain

initial water level 6.64

bottom of well 19.16

1 well Volume = 12.52 x 0.163 = 1.9

3 well Volume = 1.9 x 3 = 5.7

GW3-D

Water level initial / final	bailing Time start / finish	water withdrawn	water quality	pH	Temp °C	conductance umhos
6.64 / 14.82	17:25 / 17:29	2 gal	very cloudy	7.80	10.1	720
7.77 / 12.80	17:42 / 17:45	4 gal	very cloudy	7.54	9.6	730
8.66 / 12.75	17:54 / 17:57	5 1/4 gal	very cloudy	7.48	9.6	720
9.59 / 11.32	18:02 / 18:03	5 3/4 gal	very cloudy	7.50	9.7	720
		purge	completed			

GW3-A

Water level initial / final	bailing Time start / finish	water withdrawn	water quality	pH	Temp °C	conductance umhos
10.30 / 6.40	17:30 / 17:33	1 1/4 gal	very cloudy	—	—	—
13.60 / 15.16	17:47 / 17:50	2 1/4 gal	very cloudy	7.73	9.5	350
13.75 / 15.25	18:06 / 18:08	3 1/2 gal	very cloudy	7.73	9.4	370
13.75 / 15.50	18:23 / 18:25	4 gal	very cloudy	7.67	9.6	360
		purge completed				

9/16/88

18:38 back at office
help prepare bottles for next day
19:20 leave site

9/17/88

7:10 arrive at office

Ken Davis

Peter Rzeznercha

Mike Roth

John Hardeman

Calibrate HNU model PI 101
asset # 500791 probe # 500018
Span setting 2.4 calibrated with
94.7 ppm isobutylene supplied by
Liquid Carbonic

Calibrate Cole-Palmer conductivity
meter serial NO 7092005
adjust 970 to 1000
Adjust 9200 to 10000

Orion Research pH meter model SA 230
Centered on 7.00

temperature checked

0800 ~~help~~ - 17:15
help sample wells - no wells
purged

9/19/88

7:10 A.M. arrive on site.

Calibrate HNU model PI 101
asset # 500751 probe # 500018
Span setting 3.9 Calibrated with
9.42 ppm isobutylene supplied by
liquid Carbonic 9488-06588

Calibrate Cole-Palmer conductivity
meter Serial # 7092005
adjust 1050 to 1000
adjust 940 to 1000

Calibrate Orion Research model
SA 230
adjust 6.38 to 7.00

Temperature checked

Weather conditions - rainy & cool

9/19/88

805 arrive at mw 31

HNU of Well < 1 ppm
initial water level 10.21
bottom of well 7.55
Well Volume = 7.34 x 0.163 = 1.2
3 well volumes = 1.2 x 3 = 3.6

MW 31

Water level Initial / Final	Bailing Time start / finish	total H_2O withdrawn	water quality	pH	Temp °C	Conductance
10.21 / 11.30	8:20 / 8:22	1¼ gal	cloudy	7.44	10.2	860
11.15 / 12.10	8:23 / 8:24	2½ gal	Cloudy	7.71	10.2	840
12.00 / 12.30	8:25 / 8:26	3¾ gal	Cloudy	7.62	9.8	860

purge completed

835 arrive at mw 28

Initial H_2O level 3.34
Bottom of well 14.83
1 well Volume = 11.49 x 0.163 = 1.879
3 well Volume = 3 x 1.87 = 5.6 gallon

9/19/88

MW 28

Water level Initial/Final	Bailing Time start/Finish	Total H_2O withdrawn	water quality	pH	Temp °C	conduct mhos
3.37/9.25	8:42/8:45	$1\frac{3}{4}$ gal	slightly cloudy	8.18	11.9	510
7.00/11.00	8:50/8:52	$3\frac{1}{2}$ gal	slightly cloudy	8.01	11.6	510
6.35/10.	9:23/9:25	5 gal	cloudy	8.16	11.3	510
7.00/9.60	9:39/9:40	$5\frac{3}{4}$ gal	cloudy	8.19	11.2	520

purge completed

Water level initial/final MW35	Bail Time start/Finish	Total Water withdrawn	water quality	pH	Temp °C	Conduct mhos
5.43/10.50	9:12/9:14	$1\frac{1}{2}$ gal	slight cloudy	8.16	14.2	150
6.60/9.53	9:47/9:48	$3\frac{1}{2}$ gal	slightly cloudy	8.18	14.8	160
7.60/10.00	9:53/9:54	4 gal	slightly cloudy	7.82	14.5	175
8.90/10.00	10:03/10:04	$4\frac{1}{2}$ gal	slightly cloudy	7.68	14.5	185

MW35

initial water level 5.43

bottom of well 14.46

1 well volume = 9.03 x 0.163 = 1.47

3 well volume = 3 x 1.47 = 4.41 gal

9/19/88

10:35 arrive at MW2

initial water level 12.29

bottom of well 26.75

HNU of well = 0 ppm

1 well volume = 14.46 x 0.163 = 2.36

3 well volumes = 3 x 2.236 = 7.08

PVC well - lock has been cut off

Water level initial/Final	Bailing Time Start/Finish	Total H_2O Withdrawn	Water Quality	pH	Temp °C	Conduct mhos
12.29/17.1	10:45/10:48	$2\frac{1}{2}$ gal	very, very cloudy	7.62	10.3	820
17.07/17.50	10:50/10:53	5 gal	very very cloudy	7.60	10.7	950
17.20/18.90	10:55/10:54	$7\frac{1}{2}$ gal	very very cloudy	7.54	10.9	1000

purge completed -

note heavy sediment load in water

11:12 arrive at MW1 note PVC well

HNU of well

Initial Water level reading 15.26

bottom of well 26.19

1 well Volume = 10.93 x 0.163 = 1.78

3 well Volumes = 1.78 x 3 = 5.34 gal

9/19/88

MW1

Water level Initial/final	Bailing Time Start/Final	Total H_2O withdrawn	water quality	pH	Temp °C	Conduct mhos
15.26/17.0	11:18/11:22	2 gal	very very cloudy	7.78	12.1	950
17.00/19.60	11:23/11:25	4 gal	very very cloudy	7.62	11.8	1080
18.00/22.33	11:28/11:38	5 gal	very very cloudy	7.68	11.6	1090
22.00/22.15	11:38/11:39	$5\frac{1}{2}$ gal	very very cloudy	7.59	11.4	1110

purge completed

Finish up 11:46
lunch 11:50 - 12:35
12:35 pick up JoAnn A.B. at Airport
13:00 Decon bailers

14:05 arrive GW2-E

initial water level 12.98
bottom 20.2
1 well volume = 7.22 X 0.163 = 1.18
3 well volumes = 1.18 X 3 = 3.54

9/19/88

GW2-E

water level Initial/final	Bailing Time Initial/final	Total H_2O withdrawn	water quality	pH	Temp °C	Conduct mhos
12.98/15.37	14:13/14:15	1 gal	very cloudy	7.16	12.0	1440
15.30/16.10	14:17/14:19	2 gal	very very cloudy	7.12	11.1	1480
14.00/16.85	14:26/14:28	$3\frac{1}{2}$ gal	very very cloudy	7.11	11.3	1450

purge complete

14:37 arrive at GW2-D
HNU of well → 0 ppm
initial water level 13.75
bottom of well 23.42
1 well volume = 9.67 X 0.163 = 1.58
3 well volume = 1.58 X 3 = 4.74 gal

9/19/88

GW2-D

water level initial/Final	bailing start	Time Final	Total H_2O Withdrawn	water quality	pH	Temp °C	Conduct µmhos
13.75/22.00	14:43/	14:46	2 1/2 gal	very very cloudy	7.03	15.2	760
14.03/22.50	16:45/	16:47	3 3/4	very cloudy	7.53	16.0	840
start next day	9/20/88		purge	completed on		9/20/88	
13.79/23.[illegible]	9:02/	9:07	4 3/4 gal	very cloudy	7.40	10.5	880
12.40/23.50	9:16/	9:16	5 gal	very cloudy	7.30	9.9	870

14:58 move on to MW 37

HNU of well = 0 ppm

initial water level 4.16

bottom of well 18.07

well volume = 13.91 × 0.163 = 2.27 × 3 = 6.81 gal

MW 37

water level initial/Final	Bailing start/	Time Finish	Total H_2O Withdrawn	water quality	pH	Temp °C	Conduct µmhos
4.16/12.25	15:06/	15:10	2 gal	slightly cloudy	7.62	17.8	360
6.00/13.25	16:28/	16:33	5 gal	very cloudy	7.71	16.1	360
7.00/12.10	17:36/	17:39	6 3/4 gal	very cloudy	7.81	16.6	350

purge completed

9/19/88

15:30 go to Civ E to pick up letters and make copies

16:15 get rid van stuck at GW2-D

16:25 get van unstuck

17:00 arrive at MW 41

HNU of well - 0 ppm

initial water level 10.25

bottom of well 14.50

well volume = 4.25 × 0.163 → 0.69 × 3 = 2.07 gal

MW41

water level initial/Final	bailing start/	Time Final	Total H_2O Withdrawn	Water quality	pH	Temp °C	conduct µmhos
10.25/12.21	17:[illegible]/	17:12	1 3/4 gal	almost clear	7.56	16.7	350
12.50/13.75	17:15/	17:16	1 1/4 gal	partly cloudy	7.67	16.6	350
12:10/13.40	17:25/	17:26	2 gal	partly cloudy	7.76	15.9	370

purge complete/

Finish up leave site 17:40

17:55 - decontaminate sampling equipment

prepare bottles for next day

18:55 leave site

9/20/88

7:06 AM arrive on site

Calibrate Cole-Palmer Conductivity meter serial # 209 2005
adjust 1050 to 1000
adjust 9400 to 10000

Calibrate Orion Research Model SA230
adjust 7.54 to 7.00
adjust 9.20 to 9.90 all the way it will go
Temperature checked

Calibrate HNU model PI 101 asset # 500791 probe # 50098
span setting 4.2 calibrated with 94.7 ppm Isobutylene supplied by Liquid Carbonic batch # 9488-0115 88 lot # 12

Weather - Cloudy cold and windy

9/28/88

9:18
finish purging 6002-D

9:30 arrive at MW 40
9:33 Jeanne B. shows up with a severely lacerated finger; take her back to field office to get instructions to take her to the hospital - J. Harden says he will take her to the hospital
9:55-10:30 decon bailers and water level indicator

11:00 arrive at MW 40
HNU of well 7 0ppm
initial water level reading 4.54
bottom of well 14.58
1 well volume = 10.04 x 0.163 = 1.64
3 well volumes = 1.64 x 3 = 4.92

9/20/88

MW 40

Water level initial/Final	Bailing Time Start/Finish	Total H_2O withdrawn	water quality	pH	Temp °C	conduct mmhos
4.54 / 8.00	11/01/11:13	1 3/4 gal	almost clear	7.25	13.0	320
6.92/10.16	11.21/11:22	3 1/4 gal	slightly cloudy	7.20	12.8	340
7.90. 9.53	11.49/11:51	4 1/4 gal	slightly cloudy	7.27	12.4	400
9.14/9.92	12:00/12:08	5 gal	slightly cloudy	7.22	12.3	410

purge completed

12:05 leave MW40

12:18 back at field office decon water level indicator

12:30 lunch

13:30 back from lunch

14:01 arrive at GW2-C

HNU of well = 0 ppm

Initial water level reading 10.10

bottom of well 24.04

1 well volume = 13.94 x 0.163 = 2.27

3 well volumes = 2.27 x 3 = 6.81

9/20/88

GW2-C

Water level initial/final	Bailing Time start/finish	Total water withdrawn	water quality	pH	Temp °C	Conduct mmhos
10.10/14.25	14:17/14:23	2 1/2 gal	very very cloudy	6.80	10.9	170
10.92/16.00	14:35/14:39	5 gal	very very cloudy	6.71	10.4	175
11.40/18.00	14:48/14:52	7 gal	very very cloudy	6.81	10.9	180

purge completed

15:14 arrive at MW4 - note PVC well

HNU of well → 0 ppm

initial water level 8.16

bottom of well 22.16

1 well volume = 14.0 x 0.163 = 2.28 ⇒ 2.28 x 3 = 6.84

Water level initial/final	Bailing Time start/finish	Total water withdrawn	pH	Temp °C	water quality	Conduct mmhos
8.16/11.40	15:25/15:26	2 1/2 gal	6.97	12.2	very cloudy	700
9.40/11.10	15:35/15:38	5 gal	6.94	11.7	V. very cloudy	720
9.00/12.08	15:45/15:48	7 gal	6.91	11.5	V. very cloudy	740

purge completed

15:58 finish up leave site

16:15 Decon bailers at field office

9/20/88

16:43 arrive at GW2-A

HNU of well - open

initial water level 7.16'

bottom of well 12.50

1 well volume = 5.34 x 0.163 = 0.87

3 well volumes = 0.87 x 3 = 2.61

GW2-A

Water level initial/final	Bailing Time start/finish	total Water Withdrawn	water quality	pH	Temp °C	conduct mmhos
7.16/8.16	16:50/16:51	1 gal	Almost cloudy	7.28	13.3	500
8.08/8.29	16:53/16:54	2 gal	slightly cloudy	7.26	13.3	490
8.20/8.50	16:57/16:59	3 gal	slightly cloudy	7.21	13.3	490

purge complete

17:04 leave well site

17:08 arrive at MW 7 [illegible] well

HNU of well - open

Initial water level - 6.16

bottom of well 22.08

1 well volume = 15.92 x 0.163 = 2.59

3 well volumes = 2.59 x 3 = 7.78

9/20/88

MW 7

water level initial/final	Bailing Time start/finish	Total water withdrawn	water quality	pH	Temp °C	Conductivity mmhos
6.16/21.58	17:16/17:21	2 3/4 gal	cloudy	7.54	11.5	800
6.59/21.10	8:33/8:37	5 1/4 gal	slightly cloudy	7.50	11.6	740
7.16/20.71	18:10/18:13	7 1/4 gal	almost clear	7.48	11.8	730

done on 9/21/88 purge completed

17:43 decide to try to purge more water Tomorrow - very slow recharge.

17:55 back at field office - decon bailers and other equipment

8:55 Leave field office

9/21/88

7:08 Am Arrive on site

Calibrate Cole-Palmer Conductivity meter Serial # 709.2005

adjust 1050 to 1000

adjust 9700 to 10000

Calibrate Orion Research Model SA 230

Adjust 6.91 to 7.00

Adjust 9.30 to 10.00

Temperature Checked

Calibrate HNU model PI 101 asset # 50074 probe # 50008

span setting 4.9 Calibrated with 94.7 ppm isobutylene supplied by Liquid Carbonic batch # 9488-06588 lot # 12

9/21/88

8:28 arrive at ~~MW 7~~ MW 7

attempt to resume purge

data entered in table for MW7 on 9/20/88

very slow recharge

8:40 help samplers go get needed supplies for them

9:10 Aid in bottle preparation

10:00 take bottles to field office for filtering and

~~10~~ 10:40 pick up supplies

10:40 back to help samplers

11:46 Aided in the sampling of GW2-C & MW4

12:08 go to lunch

13:0 back from lunch

check sampling equipment

14:00 arrive at MW 39

need to get bailer rope for samplers

9/21/88

HNU of well → 0 ppm
initial water level 4.90
bottom of well 16.86
1 well volume = 11.96 x 0.163 = 1.95
3 well volumes = 5.85 gal

MW39

Water level initial / final	Bailing Time start / finish	Water withdrawn	water quality	pH	Temp °C	Conduct mmhos
4.90 / 9.00	14:30 / 14:37	2 gal	cloudy	7.01	12.8	490
7.00 / 8.61	14:39 / 14:43	4 gal	cloudy	6.97	11.9	560
7.26 / 9.37	14:48 / 14:52	6 gal	cloudy	7.03	11.9	570

purge completed

15:00 leave site
take bottles back to Field office
for samples
15.38 arrive @ MW 38
HNU of well - 0 ppm
initial water level 4.69
bottom of well 17.58
1 well volume = 12.89 x 0.168 = 2.17
3 well volumes = 2.17 x 3 = 6.51
slow recharge

9/21/88

MW 38

Water level initial / final	Bailing Time start / finish	Water withdrawn	water quality	pH	Temp °C	conduct mmhos
4.69 / 12.00	15:49 / 15:53	2 1/4 gal	cloudy	7.49	13.6	420
10.50 / 12.75	16:06 / 16:07	3 1/4 gal	slightly cloudy	7.45	13.0	450
10.50 / 13.83	17:21 / 17:25	4 3/4 gal	almost clear	7.36	11.9	470
13.70 / 14.92	17:57 / 17:58	6 gal	slightly cloudy	7.34	11.3	470

purge completed

MW5

Water level	Bailing Time Start / Finish	Water Withdrawn	water quality	pH	Temp °C	Conduct mmhos
3.83 / 13.75	16:28 / 16:36	3 1/4 gal	very cloudy	7.51	11.6	500
9.67 / 17.58	16:57 / 17:03	6 1/2 gal	very cloudy	7.52	11.3	500
12.01 / 17.33	17:33 / 17:36	9 gal	very cloudy	7.58	10.9	500
16.16 / 17.83	17:45 / 17:47	9 gal	very cloudy	7.49	10.8	490

purge completed

16:16 start at MW5 note PVC well
initial water level 3.83
bottom of well 22.86
1 well volume = 19.03 x 0.163 = 3.10
3 well volumes = 3.10 x 3 = 9.30
HNU of well → 0 ppm
17:52 leave site of well - note slow recharge

9/21/88

18:10 arrive at MW7 to complete purge

18.20 leave MW7 purge completed
see table on 9/20/88 for data

18:35 back at field office
Clean sampling equipment

1900 leave site

9/22/88

7:08 A.M. arrive on site

Calibrate Cole - Palmer conductivity meter Serial # 709@005
adjust 1000 to 1000
adjust 9400 to 1000

Calibrate Orion Research Model SA 230
Adjust 652 to 7.00
Adjust 934 to 10.00

Temperature checked

Calibrate HNU model PI 101
asset # 500741 probe # 500018
Span Setting Calibrated
with 94.7 ppm isobutylene
supplied by Liquid Carbonic
batch # 9488 - 061588 lot #12

9/22/88

8:0 arrive at GW2-B

HNU of well - 0 ppm

initial water level 4.83'

bottom of well 14.25

1 well volume = 9.42 X 0.163 = 1.54

3 well volume = 4.62

Water level initial / final	Bailing Time start / finish	Total Water Withdrawn	water quality	pH	Temp °C	Conductivity mmhos
4.83 / 5.16	8:13 / 8:17	1½	slightly Cloudy	7.07	13.7	1050
5.04 / 5.25	8:19 / 8:22	3	almost clear	7.13	14.0	1050
5.20 / 5.33	8:24 / 8:26	4½	Clear	7.17	13.8	1060

purge Completed

0834 leave well

MW6

HNU at well

initial water level 3.22

bottom of well 19.16

1 well volume = 15.94 X 0.163 = 2.6

3 well volume = 2.6 X 3 = 7.8 gal

9/22/88

MW6

Water level Initial / Final	Bailing Time start / finish	Total water withdrawn	Water quality	pH	Temp °C	conductivity mmhos
3.22 / 13.00	8:50 / 8:55	2½ gal	almost cloudy	6.88	13.3	480
7.00 / 11.75	9:12 / 9:06	4 gal	almost cloudy	6.85	13.4	470
6.00 / 13.08	9:13 / 9:18	6 gal	almost cloudy	7.02	13.4	480
6.50 / 13.25	9:25 / 9:30	8 gal	almost cloudy	7.06	13.3	480

purge completed

9:50 leave site

10 08 back at field office decon sampling equipment and get necessary equipment for site 10

Arrive at SITE 10 3 wells GW10A, GW10B, GW10C and one duplicate GW10D will be sampled. One liter poly bottle preserved with HNO_3 will be sampled for each well and duplicate. Mike Roddy and Peter Riemersma will be wearing - tyvek suits and booties

- gloves
- hard hats
- safety goggles

9/22/85

The stainless steel bailer will be left at the Site. This bailer is dedicated to Site 10

11.35 Run Water Samples back Office get Jumper cable to get other Van started

12:00 Purge Van gets stuck

13:35 Purge Van gets unstuck - go to Budget Rent a Car to find out where button is in Nissan Van

14:00 Other Van started

14:15 Go to site 10 to find well location

15:00 take Peter R. to airport

15.30 back at field office clean equipment

16:04 arrive at GW8-C

1 HNU

initial water level 5.89

bottom of well 19.42

1 well volume = 13.53 X 0.163 = 2.21

3 well volumes = 6.63

GW8-C

Water level Initial/Final	Bailing Time Start/Finish	Total water Taken Out	Water Quality	pH	Temp	Conductivity
5.89/9.80	16.11/16:14	$2\frac{1}{2}$ gal	very cloudy	~~4.4~~ 6.92	14.4	850
9.60/10.05	16:15/16:19	5 gal	very cloudy	6.88	13.9	850
10.00/10.50	16:20/16:23	$6\frac{1}{2}$ gal	very cloudy	6.86	13.7	850

purge completed

16:32 Arrive at MW8 note PVC well

1 HNU of well 0 ppm

initial water level 5.91

bottom of well 15.66

1 well volume = 9.70 X 0.163 = 1.58

3 well volumes = 4.74

MW8

Water level Initial/Final	Bailing Time Start/Finish	Total water Taken Out	Water Quality	pH	Temp	Conductivity
5.96/10.16	16:35/16:37	$1\frac{1}{2}$ gal	very clear	6.83	15.9	380
8.90/8.92	16:39/16:45	$3\frac{1}{4}$	very cloudy	6.84	14.7	380
9.06/11.20	16:45/16:48	$4\frac{3}{4}$	very cloudy	6.85	14.3	380

16:51 leave well site

17:05 take EPA 418.1 sample from GW8-C

9/22/88

17:13 Take sample 418.1 from MW-8

17:20 back at field office
start decontaminating field equipment

17:53 prepare bottles and discuss
surface water sampling and sediment
samples

18.45 leave field office

9/23/88

7:04 arrive on site

Calibrate HNU PI 101
asset # 500791 probe # 500018
span setting 3.8 calibrated with
94.7 ppm isobutylene supplied by
Liquid Carbonic batch # 9488-04588
lot #12

Calibrate Cole-Palmer conductivity
meter serial # 785 2005
adjust 1010 to 1000
adjust 9600 to 10,000

Calibrate Orion Research Model SA230
pH and Temperature meter
adjust 6.92 to 7.00
Adjust 9.50 to 10.00

Temperature checked

7:59 leave for site 10

8.13 arrive at GW10-B

background radiation < 0.1 mR/hr

HNU of well = 0 ppm

initial water level = 9.56

bottom of well = 15.11

1 well volume - 5.55 × 0.163 = 0.90

3 well volumes = 0.90 × 3 = 2.70 gal

water level initial/final	Bailing Time start/finish	Total H_2O Taken out	water quality	pH	Temp °C	conduct mmhos
9.56/10.92	8:32/8:32	1 gal	almost cloudy	7.08	10.8	500
10.39/11.48	8:39/8:40	2 gal	almost cloudy	7.12	10.6	510
10.81/11.63	8:50/8:52	3 gal	almost cloudy	7.04	10.8	500
		purge	completed			

Note: water had radiation readings of less than 0.1 mR/hr

9:10 sample GW10-B

9:15 collect Duplicate GW10-D

note purge water put into 55 gal drum for containment - Barrel inside of had HNU reading of 500 ppm

9:18 - 9:26 decontaminate sampling equipment

9:27 arrive at GW10-C

HNU of well - 0 ppm

Background radiation 0.1 mR/hr

initial water level 8.25'

bottom of well 15.22

1 well volume = 6.97 × 0.163 = 1.14 gal

3 well volumes = 3.42 gal

water level initial/final	Bailing Time start/finish	total H_2O withdrawn	water quality	pH	Temp °C	conduct mmhos
8.25/13.04	9:36/9:37	1¼ gal	slightly cloudy	7.08	10.1	480
9.44/14.33	9:51/9:50	2½ gal	Cloudy	6.99	10.4	500
10.35/12.87	10:37/10:38	3 gal	slightly cloudy	7.04	10.5	500

purge completed

note: water has radiation readings of less than 0.1 mR/hr

note purge water contained in 55 gal drum

10:57 collect sample at GW10-C

10:30 - 11:00 decon Sampling equipment

11:02 arrive at GW10-A
HNU at well - 0 ppm
Background radiation <0.1 mR/hr
initial water level 7.29
bottom of well 23.00
1 well volume = 15.71 x 0.163 = 2.56
3 well volumes = 2.56 x 3 = 7.68

Water level initial/Final	Bailing Time Start/finish	Total H2O Taken out	Water quality	PH	Temp °C	Conductivity mmhos
7.29/10.66	11:07/11:12	2½ gal	Slightly cloudy	7.12	9.8	560
8.36/14.08	11:20/11:22	5 gal	cloudy	7.00	9.9	550
N.C./12.66	11:28/11:32	7 gal	Cloudy	6.93	9.8	550

purge completed

note water has radiation readings of less than 0.1 mR/hr

note purge water contained in 55 gallon drum

11:45 collect sample GW10-A

11.50 leave site 10 Badge #
Site Personnel Mike Roddy 111210 00002
JoAnn Shewin 111210 00003

11:54 cannot leave area ~~for~~ Security police have road blocked off - ~~[illegible]~~ while F-4 has gun repaired - Air force does not want us to drive in front of F-4 while gun is jammed

12:19 permitted by Air force to proceed

12:30 arrive back at field office

12:45 go with J. Hickman to do stream flow measurements

13:00 attempt to

13:30 - 14:15 do stream flow measurement at site L

9/23/88

14:20 - go to base supply to pick up pack and Civ Eng to make photocopies

14:40 back at Field office - clean out rental car

14:55 Go to Civ Eng to make copies of chain of custody forms

15:30 back from Civ Eng

15:55 Go to Site 4 (L-11) to do stream flow measurements

Decide to use pygmy flow meter

16:45 Dan complete pygmy in place. Stream dimension 3.5 ft across 0.25' deep at bank to 0.3' deep in middle

read 19.6 on ~~pygmy flow~~ weir meter

Check to see if possible to collect surface water samples

9/23/88

7:00 - 12:20 dig holes for 217, 218, 219 for water to accumulate in

17:25 back at field office - decon equip

17:55 leave office

9/24/98

7:18 arrive at field office

Calibrate Cole-Palmer conductivity meter
Serial # 7.09.2005
adjust 950 to 1000
adjust 9400 to 10000

Calibrate Orion Research Model SA230
adjust 7.02 to 7.00
adjust 9.49 to 10.00

Temperature checked

8:30 arrive at SL-1
attempt to do stream flow measurement
decide to wait until monday to
do it
Will collect a water sample and
sediment sample

9:15 collect sample OANGB-BG-SL1-

9:30 go get filters, equipment & decon
equipment

OANGB-BG-SL1-SW1
pH 6.56
Temperature 11.6
Conductivity 110
Sample for water analysis collected about 1½' below the
surface

10:31 arrive at OANGB-BG-SL4-SW1

10:40 Field blank 1B done

10:45 Collect surface water and sediment for
site OANGB-BG-SL1-SW1

pH 6.65
Temperature 11.7
Conductivity 205
Sample for water analysis collected
about 1 ft below the surface

11:38 back at office - start filtering
metals and preparing samples for
shipment

13:00-13:30 lunch break

9/24/88

13:35 leave for background site L-3

13:50 arrive at L-3 weather - clear, warm, breeze
Decide to take sample below the
Dam

14:05 Sample taken 1' below the surface
and 6 ft from bank on side the
closest to the road

pH 7.45
Temp 14.0 °C.
Conductivity 255 mmhos

leave site 14:50

14:55 arrive site 2

15:00 Sample Barrels 1, 2, 3 for
EP Toxicity samples
note barrel found to contain
water of uncertain origin

15.30 arrive at SL:
Dig hole for water to collect in

9/24/88

15:40 leave SL:

16:00 back at field Office - start filtering
metals - preparing samples for shipment
16:15 go get ice
16:25 back - continue doing filtering and
packing samples

18:28 leave field office

9/25/88

10:30am arrive on site
10:45 leave to do stream measurements at SL1

12:05 finish stream measurements at SL1

13:15 finish stream measurements at SL2

13:30 back at field office begin filtering metals

15:00 Finish filtering metals start decontaminating equipment
15:30 leave Field Office

9/26/88

7:10am arrive on site
prepare bottles to take to site 2
and prepare labels

Calibrate HACH conductivity/TDS meter
model 44600
= 980 mS/cm adjust to 1000

Temperature checked
Calibrate Orion Research model SA230
Adjust 6.96 to 7.00
Adjust 9.92 to 10.00
Temperature checked

8:25 leave field Office

8:40 Stop at Airport
9:00 leave airport
9:08 arrive at 2SL6

9:30 sample 2SL6 - note low or no stream flow - swampy or marshy setting

10:00 Collect 2SL29 - duplicate sample of 2SL6

9/26/88

measurements for 3SL6 and 3SL29
pH. 7.14
conductivity 0.390 mS/cm
Temperature 11.8°C

10:45 collect sample 3SL7
from small stream about
2 ft wide and < .5 ft deep
note: stream was flowing at the
time the sample was taken

pH 7.57
Temp 12.0 °C
Conductivity 0.390 mS/cm

11:08 leave Site 2

11:15 back at field office
decide what needs to be taken to
site 3
1130 - dig holes at site 3 for surface
water to accumulate in

9/26/88

12:00 pick up ice.

12:15 - 13.00 lunch
load van up for site 3 and decon
sampling equipment
13:30 go to Target to get film
13:50 arrive at 3SL10 and 3SL28 (Duplicate)

14:00 Take sample 3SL10
Do field Blank FB-19
14:20 Take Sample 3SL28 Duplicate of
3SL10

Site notes: standing water no flow
bottom covered with decaying leaves and
plant matter

pH 6.72
Temp. 12.7
Conductivity 0.649 mS/cm

leave 3SL10 15:05 - drop bottles off at
Field office
15:20 arrive at 3SL8

1

9/26/88

15:30 Collect 35L8 Sample
Sample collected from marshy area
Standing water no visible stream flow

pH 7.03
temp 13.0 °C
Conductivity 0.294 mS/cm

16.08 finish 35L8 Start on 35L9

16:45 Collect Sample 35L9
note: stagnant water, shallow <0.4 ft
narrow <2 ft

Temp 13.9
pH 6.72
conduct 0.514 mS/cm

16:46 leave site 35L9

16:55 back at field office - prepare samples
for shipment - help filter metals

17:55 Take samples to Fed X

9/26/88

18:20 back from Fed X resume filters
and decon equipment

19:01 Leave site for the day

9/27/88

7:17 arrive on site
begin calibration
Calibrate HACH conductivity / TDS meter
model 44600
adjust 0.985 to 1.000
Adjust 9980 to 10.000
Temperature checked

Calibrate Orion Research Model SA230
Adjust pH 7.13 to 7.00
Adjust pH 9.94 to 10.00
Temperature was checked

8:30 leave field office to collect
final surface water and sediment
sample and matrix spike sample
notes are in sampling records

9:50 back at field office begin filtering
samples

10:50 Go to ~~[illegible]~~ Base Supply to pick up Fed Ex
envelope and then over to site 2
to do water level measurements

9/27/88

12:30 back at field office - decide to do
background wells next - then site 8 and 4

14:10 - 14:30 lunch break ~~14:30 - 15:30~~
1430 - 15:30 Water level measurements
15:30 Take Jeanne Sherman to Airport
15:50 back from airport resume interval level measurements
Go to site 3 to collect soil sample SG C4
and duplicate sample
16:50 go to BGMW 42 for final water
level measurement
17:15 back at field office - start filtering
and packing samples and packing up equipment

22:30 leave site for the day

9/28/88

08:10 arrive onsite finish packing up equipment

10:00 leave for airport

10:45 leave duluth

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Q.2.7 Notebook 7, Slug Test Notes

This notebook contains notes taken while the aquifer slug tests were being performed. The first entry is 9 September 1988 and the last is 10 September 1988. Twelve pages were used plus a scratch page on the back cover. The pages are not numbered. They are signed by John O'Brian.

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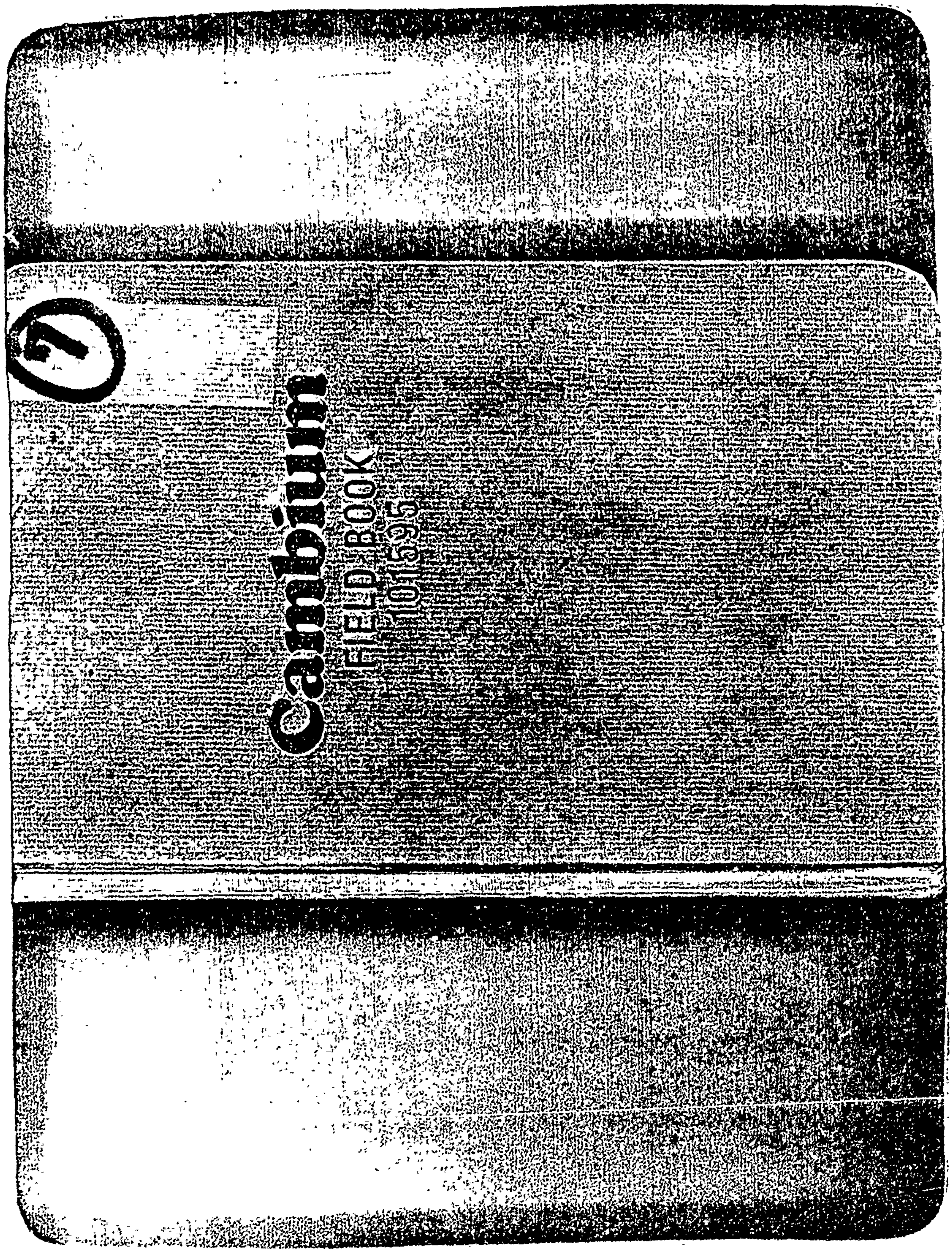
Cambium
FIELD BOOK

4 8½

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57 Executive Park
Address Atlanta, GA.

Phone 404/325-0770

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Projects
DULUTH AIR NATIONAL GUARD
OR001.02

SLUG TESTING

SLUG A diameter 1.20" Length
SLUG B diameter 1.20" Length

Projects (continued)

Project Manager:
Bob McLeod

Field Team Leader:
John Hardeman 404/325-0770

Slug Test Technician:
John OBrien 404/325-0770

Slug Test Equipment:

HERMIT Environmental Data Logger
Model SE 1000B In-Situ, Inc.
model # SE1000B
Serial # 1KB-464

* Note :

Slugs were deconned as specified in the minnesota ANG work Plan, Appendix B page 6-10 prior to testing each individual well.

Thursday
9-8-88

JFO

0700 Arrived at Duluth ANG; deconned slugs via the Minnesota Air National Guard Base Duluth International Airport Duluth, Minnesota Work Plan, Appendix B page 6-10.

0745 Participated in health and safety lecture given by on-site health and safety officer Joanna Beerler

1331 Site 3 MW 25 SIUG A

Below ground level { Static H_2O level 4'8.5"; Total Well Depth 16' }

1345 Start test o MW 5 step 0

~~Below ground { Static H_2O level 4' 6.5"; Total Well Depth 12' 9" }~~ JFO 9-8-88

1427 Start Test 0 step 1 (MW 25)

Thursday
9-8-88

John OBrien

Site 3 MW 26 SLUG A

1535 start test ~~Ø~~ 1 step 0 (mw26) JFO 9-9-88

Below Ground level
Static H_2O level 4' 6.5"
Total well Depth 12' 9.0"

1605 Start Test 1 step 1 (mw 26)
1635 End Test

1700 Site 4 MW 22 SLUG B

Below Ground Level
Static H_2O level 6' 8.0"
Total well Depth 31' 0"

1717 start Test 2 step 0 (mw22)
1748 END Test 2 step 0 (mw 22)

1748 Start Test 2 step 1 (mw 22)
1850 End Test 2 step 1 (mw 22)

1900 Left DULUTH ANG

John O'Brien

Friday
9-9-88

John OBrien

1026 Site 2 GW2-E SLUG B

Below Ground level
Static H_2O Level 11' 4.5"
Total well Depth 19' 8.5"

1058 Start Test 3 step 0 (GW2-E)
1129 End Test 3 step 0 (GW2-E)

1119 Start Test 3 step 1 (GW2-E)
1149 END ~~Start~~ JFO 9-9-88 Test 3 step 1 (GW2-E)

1337 Site 8 MW 16 SLUG A

Below Ground level
Static H_2O Level 8' 2.5"
Total Well Depth 29' 11.0"

1415 Start Test 4 step 0 (MW16)
1502 End Test 4 step 0 (MW16)

— Start Test 4 step 1 (MW16)
— End Test 4 Step 1 (MW16)

Friday
9-9-88

John O'Brien

Note

Site 8 mw16 slug Test 4 step 0 indicated well was actively recharging due to earlier sampling on 9-9-88. The slug test was stopped due to the fact that mw16 was still recharging.

1605 Site 8 GW8A SLUG A

Below Ground Level
Static H_2O Level 2' 2.0"
Total Well Depth 12' 8.0"

1629 Start Test 4 Step 0 (GW8A)
1709 End Test 4 Step 0 (GW8A)

1709 Start Test 4 Step 1 (GW8A)
1750 End Test 4 Step 1 (GW8A)

1800 Left Duluth ANG

John O'Brien

Saturday
9-10-88

John O'Brien

0815 Site 8 mw16 SLUG A

Below Ground Level
Static H_2O Level 5' 8.0"
Total Well Depth 30' 0.5"

0837 Start Test ~~4~~ 5 Step 0
0919 End Test 5 Step 0

0919 Start Test 5 Step 1
0958 End Test 5 Step 1

1048 Site 3 mw33 SLUG A

Below Ground Level
Static H_2O Level 6' 6"
Total Well Depth 22' 3"

1108 Start Test 6 Step 0
1138 End Test 6 Step 0

1138 Start Test 6 Step 1
1209 End Test 6 Step 1

Saturday
9-10-88

John OBrien

1148 Site 3 MW 34 Slug A

Below Ground Surface
Static H2O Level 6' 8.0"
Total Well Depth 12' 5.0"

1221 Start Test 7 Step 0
1251 End Test 7 Step 0

1251 Start Test 7 Step 1
1311 End Test 7 Step 1

NOTE:
Due to reference value being inadvertantly reset, the values of Test 6 Step 1 and Step 0 are incorrect.

Saturday
9-10-88

John OBrien

1243 Site 3 MW 33 Slug A

Note:
Site 3 MW 33 has recovered from earlier (1048) slug test and therefore this well will be re-tested inorder to regain the data lost previously today.

Static H2O Level 6' 8.0"
Total Well Depth 12' 5-0"

1318 Start Test 8 Step 0
1348 End Test 8 Step 0

1348 Start Test 8 Step 1
1418 End Test 8 Step 1

1500 Left Duluth ANG

John OBrien

Muzz

2'6"
9 2"
7 22 3

9'4"
- 2'6"

3 85
25
6 0

6'0"

336
- 26
310

2'6"
9'2"
9'1.5" 72
70

66
76
2

1605
30
- 65

2'8"

10 10.5 32.7
8 25 30
29.11'

2'10"
5
3
2 2"

15 6
2 10
13 6 13
12.5

[2'6"]
8'2"
5'4"

32'6.5"
30.05'

Q.2.8 Field Drilling Records

The following lithologic logs are the field notes on the core lithology, sampling and HNV readings for all deep boreholes. They were recorded by Peter Riemersma and Mike Roddy.

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ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG B-BG mw32	DRILLING STARTED: 8/29/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/29/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Ruddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60%			HNU of sample <1ppm
0-1				Boulder - moved out of way by drillers	
2-3½				Clay, mottled tan and brown, some silt, some ¼" to 2" pebbles, dry, pliable, firm	
3½-5				Clay, brown, some silt, abundant ¼"-2" pebbles, dry, pliable, firm	
5-7½		100%		Clay, brown, same as 3½-5	HNU of sample <1ppm
7½-10		100%			HNU of sample <1ppm
7½-10				Gabbro, gray, massive probable boulder.	
10-14½				Clay, brown, some silt, abundant ¼"-4" pebbles, moist to very wet firm	HNU of sample <1ppm
14½-22					HNU of sample <1ppm
14½-18				Clay, same as 10-14½	
18-20				Sand, brown, some silt and clay, abundant pebbles ¼" to 3", wet soft	
20-22.5				Sand and gravel, brown, fine sized, abundant pebbles ¼"-3", wet, soft (washout?)	
				TD 22'.5	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF 1

WELL/BORING ID: DANG Background MW42A	DRILLING STARTED: 8-18-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Roto-sonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5				Clay, light brown to brown, some silt, some pebbles, little sand, fine, dry to slightly moist, Firm to very firm	Hnu of sample <1ppm
5-10				clay, brown, some silt, some gravel, angular, little pebbles, slightly moist to 9½' very moist 9½-10'	Hnu of sample <1ppm
11-13				Concrete, powdered, white and ash like, some pebbles	
				MW 42A abandoned at 13'	

ENGINEERING-SCIENCE
DRILLING RECORD

Abandoned

WELL/BORING ID: DANG Background MW42	DRILLING STARTED: 8-18-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		55 / 100%		light brown ~~clay~~ clay, some silt, & little pebbles 1/4-2" diameter, very loose, very dry	HNU of sample <1.0 ppm
5-7.5				Clay and Silt, brown, some gravel, angular, little pebbles, very firm, slightly moist, some red granitic rock fragments up to 1" diameter at 7-7.5', gives soil reddish brown color	hit hard drilling zone at 7.5', maybe concrete
7.5-10'				Boulder, granite, quartz, plagioclase.	
				Abandoned at 12:24	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG Background MW42	DRILLING STARTED: 8-18-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-18-1988
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: P.	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		SS1 100%		~~Silt~~ clay and silt, brown, ~~and~~ with black organic rich lenses in upper 6", some sand, fine at 2-5', loose from 0-2', wet from 2-5', slightly moist from 0-2, firm	Hnu of sample <1ppm water table at est. at 2'
5-10				Silt, brown, some clay, firm to very firm, some gravel and pebbles up to 3" diameter, slightly moist	Hnu of sample <1ppm
10-15.5				clay, mottled brown and black, organic rich in black (plant frag) lens, some silt, pliable, soft, very moist to wet, so from 10-~~12'~~ 12.5, trace pebbles Silt, brn, some clay, some gravel and pebbles, very ~~fir~~ dense and hard, ~~dry to~~ very slightly moist 12.5-15.5' TD @ 15.5' at 13:30	Hnu of sample <1ppm

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANGB-BG-MW43	DRILLING STARTED: 8-18-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-18-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SSI		Peat, dark brown to black, some clay, brown, pliable, dry 0-1½' slightly moist to moist from 1½-5 little silt	
5-15				Peat, dark grey to black, some clay, ~~brown~~, ~~plant~~ occassional tree/plant frag roots, moist to very moist, natural organic odor, from 5-12.5', Peat is easily pliable and soft Peat is mottled brown and black from 12.5-13.5, with some clay Gravel and Sand, brown, fine to coarse, angular to subrounded, some clay, pebbles, rounded, ½-2" diameter 13.5-14.5', wet, loose clay, brown, little silt, soft, pliable 14.5-15'	
15-24				clay, brown, some silt, little pebbles ¼-1" diameter, soft TD @ 24'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG-2-BH1	DRILLING STARTED: 7-29-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 7-30-88
PROJECT NO: OR001	DRILLING METHOD: Hollow stem auger
DRILLER: North Star Drilling Co.	SAMPLING METHOD: split spoon
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY (sent to lab)	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-2'	14-21-18-14	40% SS-1	X	Clay, brown with black mottled areas, stiff, micaceous, some silt. Strong oily smell with dark black areas more odorous. Sample dry.	HB = HNU reading in breathing zone; HA - HNU reading at top of auger hole; 1:39 PM HB 0 ppm; 2:01 PM HA No reading
2-4'	9-11-10-10	40% SS-2	X	Clay, same as above oily odor	HNU reading of split spoon tip is 150 ppm - send to lab
4-6'	16-35-22-22	~~At~~ <5% recovery SS-3		clay, same as above oily odor	2:40 HA 7ppm; HB 0ppm; split spoon head space HNU of 4-6' was 175 ppm from small sample
6-8'	9-5-9-8	30% SS4	X	Clay sandy, silty, ~~brown~~ med to dK brown, micaceous Damp - strong hydrocarbon odor. At base of split spoon get some stiff grey clay - plastic.	3:21 PM HA - 0 ppm; Split spoon head space 225 ppm
8-10'	1-4-12-25	SS 5	X	Clay, sl. sandy, Grayish green. Top 18" grades into a dark brown sandy silty clay w/ strong fuel odor.	HNU-A 0ppm; split spoon headspace 175 ppm; stopped work at 8' 17:00

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 2-BH 1	DRILLING STARTED: 7-29-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 7-30-88
PROJECT NO: OR001	DRILLING METHOD: Hollow Stem auger
DRILLER: North Star Drilling Co.	SAMPLING METHOD: Split spoon
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

SAT.

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY LAB	SAMPLE DESCRIPTION	WELL CONSTRUCTION
10-12'	10-28-20-25	75% SS6	X	clay, some silt, little sand, fine, trace pebbles, dark brown with light grayish-green mottled areas, petroleum odor strong, wet sample	HA 45 ppm HB <1 ppm split spoon headspace reading 5ppm
12-14'	8-9-17-27	75% SS7		Clay, dark brown, some silt, lower 1' has trace pebbles, upper 6" has thin cm thick Sandy, medium-coarse, pebbly, laminations, ~~slight~~ weak petroleum odor, moist, firm consistency	HA 30ppm HB <1ppm split spoon headspace 5ppm
14-16'	11-27- 12inch sample refusal	100% SS-8		Clay and Silt, ~~clay~~, some sand, ~~some silt~~, dark brown, sand is fine to medium, ~~trace~~ little pebbles 1/4" to 1" diameter moist to wet, no odor,	HA 110 ppm HB <1 ppm split spoon headspace - no reading - 0ppm
				B.O @ 16' auger refusal	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG2 BH2	DRILLING STARTED: 7-30-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-1-88
PROJECT NO: OR001	DRILLING METHOD: Hollow Stem Auger
DRILLER: North Star Drilling Co.	SAMPLING METHOD: split spoon
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-2'	11-10-12-20	ss-1 100%	X	Clay, some silt, pebbly with 1/8" to 1½" diameter, dark brown with black mottled areas, firm, dry, strong hydrocarbon odor	split spoon headspace 90 ppm w/ HNU; HA 180 ppm; HB 0 ppm
2-4'	17-22-16-18	ss-2 75%		Clay, same as above with increased number of pebbles, size of pebbles 1/2 to 2 inch diameter, dry, strong petroleum odor	
4-6	4-9-10-15	ss3 80%		Clay, same as above, rare wood fragments, some pebbles 1-2 inches, strong odor. Some sandy silt layers ½ inch thick	HA 70 ppm; split spoon headspace 40 ppm
6-8	10-15-8-6	ss4 50%	X	Clay, same as above, strong petroliferous odor, pebbles common, dry, firm. At very base of spoon got some organic rich planty material - peat	HA 10 ppm; HB <1 ppm; split spoon headspace 400 ppm
8-10'	3-5-4-9	ss5 40%		Peat and clay, ~~upper~~ brown to black, loose, upper 3" is peat with plant fragments, lower 8" is clay, firm, rare 1/8" pebbles, moist	HA 150; HB 0 ppm; split spoon headspace 30 ppm
10-12'	4-7-14-13 (13)	ss6 80%	X	Silt, dark brown, some clay, soft, little pebbles common, strong petroleum odor, moist to wet	HA 35 ppm; HB 0 ppm; splitspoon head

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 2 BH-2	DRILLING STARTED: 7-30-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-1-88
PROJECT NO: OR001	DRILLING METHOD: Hollow Stem Auger
DRILLER: North Star Drilling Co.	SAMPLING METHOD: split spoon
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
12-14	8-6-18-21	85%	SS7	Silt, brown, some clay, little sand, trace pebbles, very moist, almost all saturated. Some dark black plant rich areas (peat)	HA 4ppm HB - 0ppm splitspoon headspace to 35ppm
14-16	8-20-11-13	SS 8 70%		Silt, brown, some sand, fine to medium, some clay, firm, rare plant fragments, very wet, water in split spoon, slight petroleum odor, some pebbles	HA 3ppm HB 0ppm splitspoon headspace reading is 5ppm
16-18	12-23-25 auger split spoon 18" refusal down	SS 9		Silt, brown, some sand fine to coarse, firm, lower 4" dry silt and clay, slight petroleum odor, moist to wet	HA 60ppm HB 1/2ppm SS headspace 5ppm
18-20	5			Sample attempt failed due to boulder? in the way	HA 40ppm HB 0ppm
20.-				Boulder still in the way	HA 5ppm HB 0ppm
20.5-	spoon down 4" before refusal	SS 10		Sand, dark brown, fine to medium, some clay, some silt, pebbles 1/8 to 1/4" common, to wet, no petroleum odor	8-1-88 HA 15ppm HB 0ppm
21.1				Auger refusal, interpreted as bedrock TD 21.1'	

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DRILLING RECORD

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WELL/BORING ID: DANG2-MW12	DRILLING STARTED: 8-4-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-4-88
PROJECT NO: OR001	DRILLING METHOD: Rotusonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma + JoAnn Sherwin	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-2'		SS1 100%		Clay, brown, some silt, dry, no odor	HNU of sample <1ppm
2-~~4~~5'		100% SS2		clay, same as above with pebbles 1/4-1" diameter slightly moist	HNU of sample <1ppm
5-~~10~~15'		~~60%~~ SS3 33% sample compressed 3' out of 10		clay and silt, brown to dark brown, little sand, few pebbles, up to 1/2", firm, slightly moist, no odor. Pebbly zone in lower 6" of the core, damp with some sand and little clay; Probably lost lower 3'	Hnu of Sample <1ppm HB = 0ppm water table estimate at 12'
15-20		100% SS~~4~~ 5		Silt, brown, some clay, firm, little small pebbles, in bottom 2', moist Silt and Gravel in upper 3', gravel composed of pebbles from 1/4-1" diameter, very firm and hard, very moist, some dark gray colored areas, some clay Color is grayish brown 5YR 3/2	HA - 0 ppm HB - 0ppm Streak of clayey silt Color N3 dark gray at about this depth
20.3'-23'		3' of bedrock		cored bedrock, 3' of dark, mafic hornblende, pyroxene, some quartz, quite heavy, competent TD 23'	HB-0ppm

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DRILLING RECORD

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WELL/BORING ID: DANG2 MW-13	DRILLING STARTED: 8-5-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-5-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD: continuous coring
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: P. Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY LAB	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-2		100% SS1	X	~~Clay~~ Clay, dark brown in upper 1', abundant root and plant fragments some silt, loose, slightly moist (from rain) Silt in lower 1', some clay, firm, little pebbles	sample HNU - 0ppm
~~2-5~~					
2-5		SS2		Silt, some clay, brown, scattered pebbles ¼-1", very firm slightly moist	HB - 0ppm
5-15		100% SS3		Silt, brown, and Clay, pebbles ¼" to 3" diameter, several areas at 7-7½', 8-8½ of Sand fine-grained, some clay, damp entire. Sample is damp and very firm except for bottom 1'-1½' where we get a ~~few~~ Sand, fine-coarse-grained, pebbly, loose, wet. From 5-15' seems to coarsen downward, increase in amt of sand	HNU of sample - 0ppm
15-19.5'		14'-15' SS4	*	Bedrock	rough drilling at 15' cored bedrock 15-19.5'
				TD 19.5'	

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DRILLING RECORD

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WELL/BORING ID: DANG82- MW37	DRILLING STARTED: 8-15-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-15-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: P. Riemersma + M. Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SSI		Clay, brown, some silt, trace sand, fine pliable, soft, moist to slightly moist	HNu of sample 1.5-2.0 ppm
5-16				Clay, brown, some silt, ~~some~~ little gravel and pebbles 1/4-1" diameter, firm, moist from 5-5½, slightly moist (5-16)	Hnu of sample <1.0 ppm
				Sand, brown, fine to coarse, some gravel, little clay, loose, wet 16-16'8"	
16-18.5'				Clay, same as above, 5-16, little pebbles, moist 16'8"-18½' ~~some~~ pebbles up to 5' diameter	Hnu of sample <1 ppm
				Bedrock, 18-18½,	
				TD @ 18½'	

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WELL/BORING ID: DANGB 2- MW38	DRILLING STARTED: 8-13-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-13-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60% SS1		Clay, brown some silt, little sand, fine trace pebbles, firm, slightly moist	Hnu of sample <1ppm
5-10		100% SS2		Clay and Silt, brown, little sand, fine, ~~some~~ little gravel, firm slightly moist	Hnu of sample <1ppm
10-15.5		200% recovery SS3		10'-10'2" Gravel and Sand, fine-coarse, wet, loose, rock fragments Clay and Silt, brown same as 5-10'	Hnu of sample <1ppm
15.5-19		100% SS4		Clay and silt, same as above	
19-20'				Bedrock,	
				TD @ 20'	

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WELL/BORING ID: DANG82 - MW38A	DRILLING STARTED: 8-12-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-12-88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma and Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60% SS1	got upper 2-2½' in recovered	Clay, brown, some silt, a little pebbles, rounded ¼-1", slightly moist, firm	Hnu of sample <1ppm
5-10		100% SS2		Silt, brown, some clay, some pebbles, Firm to very stiff, moist to dry (8½-10) Some pebbles up to 4"	Hnu of sample <1ppm
10-~~15~~ 13.5		100% r. extruded		Silt, some clay, same as 8½-10' interval, very stiff, dry to slightly moist	HB <1 ppm HA <1 ppm hit something hard (boulder?) at 13.5'
13.5-16				Boulder, gabbro, dark gray-black color	
16-16'8"				Gravel, fine to coarse, some coarse sand, angular to subrounded, loose, minerals include rock fragments and rounded pebbles	
				ABANDONED @ 25'	

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WELL/BORING ID: DANGB 2- MW40	DRILLING STARTED: 8-16-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-16-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E. Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5	60% 0-3½ SS1			brown Clay, little silt, pliable, firm, moist 0-3½ with Sand, brown, some gravel, two inches thick at 3'-3'2", dry to slightly moist	Hnu of sample < 1ppm
5-15.5	100% SS2			Clay, brown, some silt, pebbles 1/4"-~~6~~5" diameter common throughout this interval, trace sand, fine, moist to slightly moist, pliable, wet Fine sand at 14.5-15.5	Hnu of sample 0-1.5 ppm Hnu of sample 1~~0~~5-15.5 < 1 ppm
15.5-17	SS3			clay, same as above, small 1" long 1/2" thick orlenticular sand, fine-medium Bedrock, 16'3"-17' TD @ 17'	

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WELL/BORING ID: DANGB2 MW41	DRILLING STARTED: 8-17-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-17-88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE: Mike Roddy	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%		Clay, brown, little silt, abundant pebbles 1/4" to 3". Damp to moist. 4-5' gray clay layer, firm, very tight.	HNU of sample <1ppm
5-15'		100%	very	5-7' silt, brown, ~~little~~ sand and clay, abundant pebbles 1/4" to 3" wet. 8-9' clay, brown, some silt, pliable abundant pebbles 1/4" to 3", wet. 9-12' silt, brown, some clay, little sand, abundant pebbles 1/4" to 3" moist to wet 12-15' clay, brown, little silt, firm to very firm, moist, abundant pebbles 1/4" to 3"	HNU of sample <1ppm
15'-20'		80%		clay, brown, some silt, firm, moist, abundant pebbles 1/4" to 4".	HNU of sample <1ppm

ENGINEERING-SCIENCE

DRILLING RECORD

WELL/BORING ID: DANG2 WP-6	DRILLING STARTED: 8-1-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-3-88
PROJECT NO: OR001	DRILLING METHOD: Hollow Stem Auger
DRILLER: North Star Drilling Co.	SAMPLING METHOD: split spoon
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-2	6-11-15-16	SS-1 80%		Silt ~~Clay~~, some sand, some clay ~~Silt~~, light brown, upper six inches dark brown, loose, rare pebbles, upper 6 inches root fragments, dry, no odor	0ppm split spoon headspace
5-7'	6-10-18-32	SS-2 80%		Clay, some silt, medium to dark brown, w/pebbles to > 15". At basal ~~is~~ 1" a dark brown to black coarse grained sand. slightly damp, no odor	0ppm split spoon headspace HA - 0ppm
10-12		no sample split spoon refusal			HA - 0ppm
10-12'	11-14-24 -6 For 2"	SS-3 70%		CLAY, upper 10" of spoon moderate brown 5YR 3/4, some sand, pebbles, black heavy minerals (hornblende?) common, slightly damp and Sand, in lower 8". dusky yellowish brown 10YR 2/2 (black looking) medium to coarse, pebbly, subangular quartz and black accessory minerals, sand is wet, ~~We found 1 black angular pebble~~ PGR	move 7' W to new location samples named WP6-2 HA 0 ppm HB 0 ppm Water at 10.5'
15-17'				No split spoon taken due to rocks TD at ~~B~~ 25.4	HA <1 ppm HB <1 ppm

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DRILLING RECORD

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WELL/BORING ID: DANG B2WP7	DRILLING STARTED: 8-17-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-17-88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE: Mike Roddy	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%		Clay, brown, some silt, plastic, organic fragments - thin peat layer at 1' approximately 8" thick moist to wet 0-5', pebbles 1/4" to 3" common	HNU of sample <1ppm.
5-8'		100%		Clay and silt, trace sand, brown, plastic to firm. abundant pebbles 1/4" to 3", moist to wet Alternating Clay layers ~~with~~ 6"-8" thick with coarser silt, some sand, abundant gravel layers between. Coarse layers are saturated	HNU of Sample <1ppm
8-11'		100%		8-~~10~~' Sand, brown, little silt and clay, abundant gravel 1/4"-2" Wet - saturated ~~10~~-10' Clay, brown, abundant pebbles, moist, 10-11' sand, brown, little silt abundant pebbles 1/4"-2", wet	HNU of sample <1ppm.
11-15'		100%		11-12' sand, brown, little clay and silt, pebbles 1/4-3" abundant, wet 12-15' Clay, gray-brown, firm, abundant pebbles 1/4" to 3", moist ~~to damp~~	HNU <1ppm

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WELL/BORING ID: DANG B2 WP 8	DRILLING STARTED: 8-17-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-17-88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE: Mike Roddy	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5 ft		80%		clay, brown, little silt, soft, some pebbles 1/4" to 2". Tan brown 0-3½', dark brown 3½-5'	HNU of sample <1ppm
5-8'		100%		clay, brown, little silt, soft some pebbles 1/4" to 2", moist.	HNU of sample <1 ppm
8-12'		100%		clay, brown, some silt little sand, abundant pebbles 1/4" to 4", moist to damp.	"
12-14'		100%		silt, brown, some clay, little sand, abundant pebbles 1/4" to 4", wet	"
14-15'		100%		Gabbro, gray, massive, ~~probable boulder?~~	"
15-18'		100%		Gabbro, gray, massive bedrock	"

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGBZ WP 7D	DRILLING STARTED: 8-16-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-16-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLES BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		100% SS 1		Clay, brown, little silt, some organic plant fragments, 0-1' moist, pliable Peat, black, 1-2' moist clay, some silt, little sand, fine, pebbles 1/4"-3" common, wet from 3-5', to very moist, thin sand lens appear saturated	Hnu of sample <1 ppm
5-15'				5-10' Clay and Peat, brown and black, mottled, some silt 5-6', very moist, firm Clay, some silt, some pebbles, same as clay from 3-5", very moist 6-7 Sand and Gravel, fine to coarse, gravel is angular to subrounded, little clay, loose, wet, from 7-9 1/2 some pebbles 1/4-4" diameter Silt, d. brown, some clay, trace pebbles, slightly moist, very firm to dense Sand and Gravel, layer fine to coarse, same as sand and gravel layer above, 13.5-14.0 but increase in pebbles to 30%, wet Silt, same as silt from 9 1/2-13, 14-15'	Hnu of sample <1 ppm ~~Hnu~~

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 52 WP 7D	DRILLING STARTED: 8-16-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
15-23.4'		100% 55		Gravel, fine to coarse, angular, some pebbles, wet, loose, some sand, 15-15½ Silt, d. b/n some clay, some pebbles, rounded diameter up to cobble size 4", slightly moist, very firm (very stiff). - becomes moist at 18' with increase to little sand, fine - is dry at 22-23.4', very hard few pebbles,	Hnu of sample < 1ppm
23.4'-25'				Silt and Clay, brown, some pebbles ¼-1"; rounded to angular, dry to slightly moist, very firm to hard,	
25'-29'				Bedrock 26½-29', cobbles from 26½-	
29-33'				Bedrock	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG 83 MW29	DRILLING STARTED: 8/30/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/30/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80%		Clay and silt, brown, trace sand, abundant pebbles 1/4" to 4", moist to wet, soft	HNU of sample <1ppm
5-16		90%			HNU of sample <1ppm
5-7				clay and silt, same as 0-5	
7-14				Clay, brown, little to some silt, abundant 1/4" to 4" pebbles wet, firm	
14-16				Sand, brown, little gravel, some silt, trace clay, soft, wet, abundant 1/4" to 3" pebbles	
				TD 16'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG B3 MW25	DRILLING STARTED: 8/26/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/26/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80%		Clay, brown, some silt, trace sand, abundant 1/4" to 4" in diameter pebbles, soft, moist to wet	HNU of sample <1 ppm
5-15		100%			
5-14		-		Clay and silt, brown, trace to little sand, abundant 1/4" to 4" pebbles, soft to firm, wet	HNU of sample <1 ppm
14-14½				Sand, brown, some clay and silt, abundant pebbles 1/4"-2", soft, wet	
14½-15				Same as 5-14	
15-18		100%		Gabbro, gray, massive, coarse-grained intrusive rock, plagioclase with minor pyroxene? and opaque metallic mineral	HNU of sample <1 ppm
				TD 18'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B1MW30	DRILLING STARTED: 8/26/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/26/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Rodda	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5.5		80%		Clay and silt, brown, trace sand abundant 1/4" to 4" pebbles, moist to wet, soft to firm, gabbro boulder from 1½-2½'	HNU of sample <1 ppm
5-6.5		100%		clay and silt, mottled brown and gray, wet, firm, abundant 1/4-2" pebbles: boulder 5¾-6¼.	HNU of sample <1 ppm
6.5-~~8.0~~ 9 nsa		100%		Gabbro, gray, massive, Coarse grained plagioclase, opaque metallic ~~and~~ minerals	HNU of sample <1 ppm
9-15		100%		silt, brown, some clay, little sand, abundant 1/4"-4" pebbles soft-firm, wet	HNU of sample <1 ppm
15-17.5		90%		Silt brown, some clay and sand abundant 1/4"-4" pebbles, soft, wet Similar to 9-15 TD - 17.5 Ft	HNU of sample <1 ppm

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B3MW26	DRILLING STARTED: 8/26/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/26/88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD: Roto sonic
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Ruddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60%		Clay, brown, little to some Silt, abundant pebbles 1/4" to 4", in diameter moist-wet, soft 2" gravel coarse sand layer ~~from~~ between 4-4.5'	HNU of sample < 1 ppm
5-14.5		100%		Clay and Silt, brown, trace to little Sand, abundant 1/4" to 4" pebbles, wet, soft-firm	HNU of sample < 1 ppm
				TD 14.5 ft	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG 33 MW 27	DRILLING STARTED: 8/24/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/24/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80%			HNU of sample <1ppm
0-2				Clay and Silt, gray (0-1), brown (1-2) Trace sand, occasional pebble 1/4"-2". Wet to moist, soft	
2-5				clay, brown, mottled, little to some silt, occasional pebbles 1/4"-2", moist to wet, soft	
5-15		100%		Clay, brown, some silt, abundant pebbles 1/4" to 4" in diameter, wet, firm to very firm	HNU of sample <1ppm
				TD 15'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B3 MW 28	DRILLING STARTED: 8/27/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/27/88
PROJECT NO: OR00?	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%			HNU of sample <1 ppm
0-1'				Clay, black, little silt, moist soft	
1-4'				Clay, mottled gray and brown, little silt, occasional 1/4-2" pebbles, moist, soft	
4-5				Clay, brown, some silt, abundant 1/4-2" pebbles	
5-11.5		100%		clay and silt, brown, trace sand, abundant 1/4" to 4" pebbles, moist to wet, soft to firm	HNU of sample <1 ppm
11.5-12.5		100%		Gabbro, gray, massive, very coarse grained, some chloritic alteration probably a boulder	HNU of sample <1 ppm
12.5-15		60%		Clay and silt, brown, trace sand, abundant 1/4" to 4" pebbles, wet firm to very firm	HNU of sample <1 ppm
				TD 15'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B3 MW 31	DRILLING STARTED: 8/27/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/27/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Reddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%	SS1	Clay and silt, tan brown mottled, little trace to sand abundant pebbles 1/4" to 4" in diameter, soft, moist to very moist	HNU of sample <1ppm
5-7½		100%		Clay and silt, brown, trace sand, abundant 1/4" to 4" pebbles firm, moist	HNU of sample <1ppm
7½-15		15%	SS2	Clay and silt, brown, trace sand, abundant 1/4" to 4" pebbles, wet Soft-firm Gabbro Boulder from 7½-8½	HNU of sample <1 ppm
15-18 15-16 16-18		80%		Sands and gravels, gray, fines washed away Gabbro, gray, massive, coarse-grained plagioclase, Pyx, metallic opaque metallic minerals. probably Bedrock TD 18'	HNU of sample <1 ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 3 MW 33	DRILLING STARTED: 8/27/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/27/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60%			HNU of sample <1 ppm
0-1				Clay and silt, black, abundant 1/4" to 2" pebbles, abundant organic matter, soft, moist	
1-5				Clay and silt, brown, abundant 1/4"-3" pebbles, firm, moist	
5-15		100%			HNU of sample <1 ppm
5-12				Clay and silt, brown, trace sand, abundant 1/4" to 2" pebbles, moist to wet (@12), firm	
12-15				Silt, brown, some clay and sand, abundant 1/4" to 3" pebbles, wet, firm	
15-21		100%		Silt, brown, some sand and clay, abundant 1/4" to 3" pebbles, firm, wet	HNU of sample <1 ppm
21-24		70%			HNU of sample <1 ppm
21-21.5				Sands and gravels, gray-brown, fines washed out by drilling	
21.5-24				Gabbro, gray, massive probably bedrock	
				TD - 24'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG B3 MW 34	DRILLING STARTED: 8/29/85
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/29/85
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Ruddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		75%		Clay, brown, little to some silt, abundant 1/4" to 3" pebbles, soft moist	HNU of sample <1 ppm
5-15 5-7		100		Clay, brown, some silt, abundant 1/4" to 3" pebbles, soft, moist	HNU of sample <1 ppm
7-13				Clay and silt, brown, trace of sand, abundant 1/4" to 3" pebbles, soft to firm, moist to wet	
13-15				silt, brown, some clay, trace sand, abundant 1/4" to 3" pebbles, firm, wet	
				TD 15'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG 83 MW35	DRILLING STARTED: 8/25/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/25/88
PROJECT NO: OR001	DRILLING METHOD: Roto sonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Ruddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80%			HNU of sample <1ppm
0-2				Sand, black-brown, some silt, trace clay, abundant pebbles ¼" to 4", moist to wet, soft	
2-5				Clay, brown, little to some silt, abundant pebbles ¼" to 4", wet, soft	
5-11.5		85%	553	Clay, brown, some silt, trace sand, abundant pebbles ¼" to 4", wet, firm to very firm	HNU of sample <1ppm
11.5-14'		80%		Gabbro, gray, massive, course grained intrusive rock - boulder	HNU of sample <1ppm
14-15		Lost			
15-16'		80%		Clay, brown, some silt and sand, abundant pebbles ¼" to 4", very wet, firm, similar to 5-11.5	HNU of sample <1ppm.
16-17' ~~17-17'~~				Sand, brown, some silt, little clay, abundant ¼-3' pebbles, soft wet, metal ~~rotation~~ found in core	
17-17.5'				Gabbro, bedrock?	
				TD 17.5'	

ENGINEERING-SCIENCE
DRILLING RECORD

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Abandoned

WELL/BORING ID: DANG B3 MW 35	DRILLING STARTED: 8/25/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/25/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Ruddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		60%			HNU of sample <1 ppm
0-2			SS1	Silt, brown, some sand, little clay, abundant pebbles 1/4" to 3", moist soft	
2-3			SS2	Sand, brown, some silt, trace clay, abundant pebbles 1/4" to 4", wet soft	
3-5				clay, brown, little to some silt ~~...~~ trace sand, abundant pebbles 1/4" to 4", moist to wet, firm	
5-6.5		100%		Silt and clay, brown, little sand, abundant pebbles 1/4" to 4", wet, firm	HNU of sample <1 ppm
6.5-7.5		100%		boulder? chloritically altered Gabbro, trace sulfides	
				TD 7.5 Ft	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG B4 MW21	DRILLING STARTED: 8-20-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER: Mike Roddy	STATIC WATER LEVEL:
GEOLOGIST: Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		40%		Sand and silt, brown, ~~soft~~ little to some clay, soft pliable, wet from 3-5 ft.	HNU <1 ppm
5-15		100%			HNU of sample <1 ppm HNU at Auger and breathing zone <1 ppm
5-6				Sand, brown, some silt and clay, little pebbles 1/4"-2", soft, pliable, wet.	
6-8				Clay, brown, little silt, few pebbles 1/4"-1", soft, wet	
8-10				silt and clay, brown, little sand, abundant pebbles 1/4"-2", soft, wet	
10-11				Sand, brown, some silt and clay, abundant pebbles 1/4 to 2" wet, soft	
11-12				clay, brown, some silt, soft, abundant 1/4"-3" pebbles, wet	
12-13				Silt and clay, brown, abundant pebbles 1/4" to 2", wet, soft	
13-15				clay, same as 11-12'	
15-19		100%		Clay, brown, little to some silt, abundant pebbles 1/4" to 2", moist, STIFF	HNU of sample <1 ppm
19-22.5		100%		Bedrock, possible narrow sand and gravel layer just above it. Gabbro, holocrystalline, massive, coarse grained intrusive rock, plagioclase laths from <1mm to 5mm, pyroxene possible sulfides	HNU of sample <1 ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-MW22	DRILLING STARTED: 8-20-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-20-1988
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Pete E Ricommo	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

change in depth when table height was measured

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'8"		SS1 70%		Peat, black, some organic material, moist, plant roots	Hnu of sample < 1.0 ppm
~~5-15~~ 5'8"-15'8"				Clay, mottled gray and brown from 5-7', brown from 7-15'; little silt, NO gravel or pebbles, pliable, firm, very moist from 5-8', moist ~~to~~ from 8-15	Hnu of sample < 1.0 ppm Hnu of auger borehole 150 ppm Hnu of breathing zone < 1 ppm water table est 5' 8:49 AM Hnu of auger hole < 1.0 ppm Breathing Zone < 1.0 ppm
~~15-25~~ 15'8"-25'8"				clay, brown, little silt, NO gravel or pebbles, pliable, Firm, 15-21 Sand, fine, layers 1-2" thick at 18.5 and 19.5, wet Silt, some clay, brown, 3" Sand, Fine layers at 22.2, 23, 23.5, NO gravel or pebbles, wet, loose	Hnu of sample < 1.0 ppm
~~25-31~~ 25'8"-31'8"				Silt, brown, some clay, some gravel and pebbles 1/4-1" diameter, firm to very firm moist, Sand, ~~som~~ brown, fine, some silt, some clay, wet 30.5 - 31	Hnu of sample < 1.0 ppm

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DRILLING RECORD

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WELL/BORING ID: DANGB-4-MW22	DRILLING STARTED: 8-20-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-20-1988
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
~~32~~-35 31'8"				Bedrock	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANGB-4-MW23	DRILLING STARTED: 8-18-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peer E Riemersma or Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80% SS1		Clay and silt, brown, some gravel and pebbles 1/4-1", loose, slightly moist, 0-4' Peat, small roots and plant material visible, damp, 4-5'	Hnu of sample <1ppm
5-15'		SS2		Peat, Same as above 5-7' Clay, mottled green and brown, little silt, pliable, firm in core, 7-7½' Clay, same as above but brown, and some silt 7'6"-7'9" Clay, brown, some silt, some sand, fine, wet, loose, 7'9"-8'1" clay, brown, little silt, pliable moist to very moist, trace pebbles 8'1"-13'5" Silt, and Sand, brown, ~~some sand~~ fine to medium, little clay, very moist, loose 13'5"-14'	Hnu of auger hole 0ppm breathing zone 0ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-MW23	DRILLING STARTED: 8-18-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-18-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter + Mike	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
15-25		100% SS3		~~Silt, brown~~ Clay, brown, some silt, little ~~trace~~ pebbles 1/4-1" diameter, firm moist from 19-21.5, slightly moist from 21.5-25, number of pebbles increase downward	Hnu of sample <1ppm
25-31 25-27 27-~~30~~ 31 ~~30-31~~ ~~30-31~~		85% SS4		Silt, brown, some sand and clay, ~~little~~ some pebbles 1/4" to 4" diameter, moist to Wet, soft Sand, brown, little silt and clay, Abundant pebbles 1/4" to 2", wet, soft,	Hnu of sample <1ppm Lab sample labeled SS3
31-33'10"				Bedrock	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG B4-MW24	DRILLING STARTED: 8/24/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/24/88
PROJECT NO: OR001	DRILLING METHOD: Roto Sonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		50%			HNU of sample <1ppm
0-3½				Sand, brown, some clay and silt, some pebbles ¼" to 2" in diameter, wet to moist, soft.	
3½-4				Sand, brown, Trace silt and clay, wet, soft	
4-5				Clay, gray, little silt, firm, moist to wet	
5-15		90%			HNU of sample <1ppm
5-8				clay, brown, little silt, soft moist to wet, ~~[illegible]~~ little pebbles ¼" to 3" in diameter	
8-12				Clay, brown, some silt, little sand, abundant pebbles ¼" to 4" in diameter, soft, wet	
12-15				clay, brown, little silt, Trace sand, abundant pebbles ¼" to 3", moist to wet, firm	HNU of sample <1ppm
15-25		100%		Clay, brown, some silt, little sand, abundant pebbles ¼" to 4" in diameter, wet, firm	HNU of sample <1ppm
25-33'10"		50% ~~60%~~		clay, brown and gray mottled appearance some silt, little sand, abundant pebbles ¼" to 2"	HNU of sample <1ppm
33'10"-37'				Gabbro, gray ~~massive~~, massive, intrusive rock. - probably bedrock Chloritic alteration along fractures TO 37'	HNU of sample <1ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-WP11D	DRILLING STARTED: 8-19-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-19-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		80% 551		Clay, brown, some silt, abundant pebbles 1/4-2' diameter, Peat, dark brown to black layers 1" thick within interval firm, slightly moist, upper 6" of interval is Peat	Hnu of sample < 1 ppm may be fill material
5-7		100%		Peat, dark brown to black, small plant fragments, soft, moist no pebbles	hit something hard at 7' HNU of sample < 1 ppm
7-15.5				Peat, same as above, 7-9', wet Silt, brown, some clay, trace pebbles, stiff, moist with very moist zones 9-12.8' Sand, fine-medium, little silt, ~~little~~ some clay, 2" thick from 12.8-13', ~~sand~~ (1/2" thick) ~~13.1' to~~ wet, loose, pebbles Silt, same as 9-12.8' to 15.5'	
15.5-23.5				Silt, brown, ~~some~~ clay, some gravel and pebbles, very firm to stiff, slightly moist 15.5-17.5 Sand, green-~~brown~~ gray, fine to medium, trace clay, little silt, subangular, loose, moist, 17.5-17.7' Silt, same as 15.5-17.5 to 23.5' bottom 4" is moist to very moist abundant pebbles up to 2"	sand is from disintegrated rock

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG D-4 WP 11D	DRILLING STARTED: 8-19-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-19-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
23.5-24.3		100%		Bedrock,	
				TD 24.3'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-WP12S	DRILLING STARTED: 8-22-88
LOCATION. Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-22-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		50% 0-2.5		Clay, brown, organic fragments some silt, moist 0-1' Silt, brown some clay, dry to slightly moist, some pebbles 1/4-1", firm to hard 1-2.5	Hnu of sample 1.1
5-10				Clay, brown, some sand, fine, soft, wet, little silt 5-7' Clay, black-dark gray, little silt, pliable, soft, 7-7.5' moist, Clay, mottled brown and dark grey, little silt, little small pebbles, pliable, little sand, fine moist 7.5-9 Silt, brown some clay, some pebbles 1/4-1" diameter, some sand, fine, very moist, firm 9-10'	Hnu of sample <1

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-WP12S	DRILLING STARTED: 8-22-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-22-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
10-18'				Clay, brown, some silt, little pebbles, very moist, 10-11' Silt, same as 9-10', brown abundant rounded pebbles 1-3" in diameter, some gravel slightly moist, firm to very firm TD at 18'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANGB-4-WP 12 D	DRILLING STARTED: 8-22-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma	WATER LEVEL DATE:
SIGNATURE: Peter E Riemersma	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
15-25		100%		Silt, brown, some clay, abundant pebbles and gravel, diameter from 3/4 - 3", ~~moist~~ moist to slightly moist, pebbles are often rounded, firm, 15-24'6" decrease to little clay from 20-24' Sand, brown, fine, some silt, little clay, some pebbles, very moist, 24'6"-25', loose	Hnu of sample <1.0 ppm
25-31.3'		10% poor recovery appears to be similar to that above		Same as above, note poor recovery	
31.3'-34 11				Bedrock, granitic appearance	

31
41"
6'1"
34"

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANGB-4-WP 12 D	DRILLING STARTED: 8-22-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-22-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		50% SSI (0-2.5)		Clay, brown, some silt, abundant pebbles 1/4-1/2", dry, very firm to dense	HNU of sample <1.0ppm
5-15				Clay, brown, some silt, same as above 5-6, slightly moist	HNU of sample <1.0 ppm
				Sand, brown, fine, some silt, moist, stiff 6-6'6"	
				Clay, greenish blue, little silt, pliable, moist, trace sand, fine, soft 6.5'-7.5'	
				Clay, brown, some silt same as 5-6', 7.5-8'	
				Clay, mottled brown, green and red, some silt, little sand, lenses, fine to medium, moist to very moist, disintegrated rock, firm 8-10.5	
				Silt, brown, some clay, pebbles and gravel abundant, some sand, fine, moist, 10.5-11.5	
				Clay, brown, some silt, abundant pebbles, rounded up to 3" diameter, slightly moist, firm to very firm	

ENGINEERING-SCIENCE
DRILLING RECORD

WP

WELL/BORING ID: DANG E-H-13S	DRILLING STARTED: 8-22-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-~~5~~ ~~10~~ 11		60%		Clay, brown, some silt, some pebbles, 1/2-2" diameter, black layer at 6", slightly moist 0-10'	
				Sand, brown, fine, some clay 10-11	
				TD 11.5'	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF 2

WELL/BORING ID: DANG WP B-4-13D	DRILLING STARTED: 8-22-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E. Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%	~~0-5'~~	Silt, brn, some clay, little pebbles, firm, slightly moist 0-3' Peat, black, organic rich 3-4' ~~clay~~, Silt, same as silt above from 0-3'	
5-15		100%		clay, mottled brn and grey, some silt, firm, moist 5-6' Sand, light brown, fine, some clay, little silt, wet, loose-firm, little gravel 6-10' clay, brn-with gray, little silt, very pliable, soft, moist 10-15'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB- WP 4-13D	DRILLING STARTED: 8-22-1988
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-22 1988
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
15-21				Silt, brown, some clay, little sand, fine, in lenses, soft to firm, moist 15'-17 Clay, brown, little silt, pliable, soft, moist 17-18 Silt, same as 15'-17 above, some pebbles, 1/4-2", rounded, 18-21' ~~some~~ little gravel, little sand, fine	[illegible] of sample <1.0 ppm
21-25				Bedrock	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANGB-4-WP14D	DRILLING STARTED: 8-23-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-23-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma Mike Roddy Jo Ann ...	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60% 0-3		Silt and clay, brown, little pebbles 1/4-1" diameter, slightly moist, very firm to hard. Two inch (2") Peat, black from 2' to 2'2"	Hnu of sample 0 ppm
5-15		100%		Silt, same as above, 5-6 Sand, brown, fine to coarse, little gravel, little clay, wet, loose 6-8.5 Clay, dark brown, little silt, moist to very moist, pliable, firm 8.5-15'	Hnu of sample <1ppm
15-~~21.5~~ 24				Clay, same as above but moist 15-~~18~~ ~~19~~ 24 ~~Clay, brown, little silt, little gravel and pebbles, some pebbles 1/2-3" diameter, same Sand, Fine, laminations throughout interval, 1-2" thick~~ PER 8-23-88 Sand and Clay, brown, little silt, little gravel and pebbles, wet to very moist, loose, some pebbles 1/2-3" 21-24'	Hnu of sample 0 ppm

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANGB-WP 14 S	DRILLING STARTED: 8-23-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-23-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: P Rennison Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		60% 0-3		Silt and clay, brown, some pebbles, 1/4-2", Peat layer, 2-3" thick at 2.5-2.7, slightly moist	Hnu of Sample < 1ppm
5-12		70% condensed		silt and clay, mottled brn and black, same as above, 5-6 Sand, brown, fine-course, some gravel, little clay, loose, wet, gravel layer at 8' abt four inches thick, 6-10 clay, dark brown, little silt, plastic, firm, moist, 10-12 TD at 12'	Hnu of Sample < 1ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG3-4-WP14D	DRILLING STARTED: 8-23-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
24-27.5				Bedrock, TD 27.5'	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF 1

WELL/BORING ID: DANG B4 - WP15 S	DRILLING STARTED: 8/23/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S. Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5' 0-1'		60%		0-1 Sand and silt, brown, abundant pebbles 1/4" to 2" in diameter moist, soft, pliable	HNU of sample <1ppm
1-5'				peat, black, very soft moist	
5-12		100%		clay, brown to tan, some silt, abundant pebbles 1/4" to 3" in diameter. moist to wet, soft	HNU of sample <1 ppm
12-17		80%		clay, brown, little silt, occasional pebbles 1/4" to 2" in diameter, moist to wet, firm	HNU of sample <1 ppm
				TD 17'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B4-WP15D	DRILLING STARTED: 8/23/88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8/23/88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Mike S Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'		80%			HNU of sample <1 ppm
0-1'				0-1 Sand and silt, brown, abundant pebbles 1/4" to 2" in diameter, moist, soft, pliable	
1-4'				peat, black, very soft, moist	
4-4 1/4				Sand and clay, brown, soft, moist, pliable	
4 1/4-5'				clay, brown, some silt, trace sand, soft, moist, occasional pebbles 1/4" to 2" in diameter.	
5-15'		100%		clay, brown, some silt, abundant pebbles 1/4" to 4" in diameter, lower 5' ~~soft~~ firm, upper 5ft soft, moist.	HNU of sample <1 ppm
15-25		90%		clay and silt, brown, trace sand, abundant pebbles 1/4" to 3" in diameter, wet, firm to very firm.	HNU of sample <1 ppm
25-29		0%			
29-31.5		100%		Gabbro, gray, holocrystalline massive, coarse-grained intrusive rock, plagioclase, pyroxenes, trace opaque metallic minerals	HNU of sample <1 ppm
				TD 31.5 Ft	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG8-4-WP 16 D	DRILLING STARTED: 8-18-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma Mike Roddy	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SS/		Sand and Gravel, black, fine to coarse sand, some silt, loose, surface fill, slightly moist 0-1½	Hnu of sample <1 ppm
				Silt and Sand, ~~Fi~~ brown, fine, some clay moist, loose, pebbles 1/4-4" diameter 1½-2½	
				Sand, brown-black, fine-medium, little clay, wet, loose 2½-~~2~~3	water table at 2½ Fill to 3'
				clay, brown, some silt, plant roots, moist, probably marks end of fill	
				Peat, black, soft, moist	
				clay, gray-black, trace silt, pliable, soft, moist	
5-14		100% SS/		clay, brown, little silt, very soft, pliable very moist from 5-8, moist from 8-10, slightly moist from 10-14 trace pebbles from 5-10 some pebbles (abundant) from 10-14 firm from 10-14	Hnu of Sample < 1 ppm 1/4-1½" diameter hit rock at 14'
14-~~22~~' 17'				Clay, brown, little silt, pliable, soft moist, ~~f~~ 14-16.8', ~~[illegible]~~ some silt at 16-16.8, trace pebbles	Hnu of sample 2.0 ppm
				Sand, brown, fine, very moist, loose 16.8-17'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG B-4 WP 16D	DRILLING STARTED: 8-18-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
17-20 feet				Sand and Gravel, brown, little silt little clay, wet, sand and gravel ~ fine to coarse, some pebbles 2" diameter 17-20	Hnu < 1.0 ppm
20-22				silt, some clay, brown, pebbles up to 2" diameter	
~~22~~ 22-23.5				silt, brown, some clay, some pebbles and gravel, hard, slightly moist to dry	HNU of sample < 1 ppm
23.5-24.4'				Bedrock	
				TD at 24.4'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 8 MW 14	DRILLING STARTED: 8-8-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-9-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD: continuous
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		70% (3½') SS1	0-1' x	Clay, brown, some gravel 1/8 - 1/2" diameter, moist in upper 1', dry from ~~2~~-4' loose [Fill]	Hnu of sample o ppm HB o ppm
5-10		SS2		clay and silt, brown, ~~some~~ little gravel, to 7', dry, loose, some plant fragments at top. Silt, some gravel, up to 35%, ~~sand~~ some clay (15%), wet, loose. Some pebbles up to 4" diameter in this interval	Hnu of sample o ppm. Driller says hit water at 10'. Sample wet at 7'
10-15'		SS3		Sand and Gravel, brown to dark brown, ~~little~~ medium-coarse grained, angular quartz and rock fragments, little clay; wet, loose, pebbles 1/4-3" common, to 12'. Silt, some sand, fine-medium, ~~some~~ little clay, ~~some~~ 1" gravel and sand laminations, wet, slightly firm, (12-15'), pebbles 1/2" diameter	
15-2~~0~~5		SS4 (3') 30%		Clay, brown, ~~some~~ little silt, no pebbles or gravel, wet - slightly wet, pliable. Sand, ~~medium~~ -fine, at estimated 16-16½, some clay and silt, wet, interval sampled ~ 15-18	HA 0 ppm HB 0 ppm. Poor recovery due to wet sample slipping out through drill bit

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 8 MW14	DRILLING STARTED: 8-8-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-9-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
25-33.5		100% SS5		Clay, brown, little silt, trace fine-med sand, pebbles 1/4"-4", wet, pliable sand is rounded	HA 0 ppm HB <1 ppm ~~HO HNU~~ Hnu of sample at 3 locations <1 ppm
33.5-35		SS6 100%		Clay, brown little silt, trace pebbles, wet to 34', loose, pliable Clay, brn, little silt, little gravel, dry, firm 34-35', some pebbles	Harder drilling
35-39		SS7 100%		Clay, browish red, some silt, little sand, some pebbles 1/2"-3", trace granitic, gabbro rock fragments slightly moist 35-36 dry, firm 36-38 moist, pliable 38-39	Hit boulder at 35 Hnu of sample 0 ppm
39-42		SS8 100%	38-40 Lab sample Sand from 39-39 1/2	Sand and Gravel, gray, coarse, subangular to angular, loose, from 39-~~39 1/2~~ 40, some pebbles 1/2-1" Bedrock ~~39 1/2~~ 40 to 42 upper 6" fragmented	
42-44				Bedrock, gabbro	
				TD 44'	

ENGINEERING-SCIENCE
DRILLING RECORD

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WELL/BORING ID: DANG8 MW15 (shallow)	DRILLING STARTED: 8-9-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-9-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SS1		Clay, ~~some~~ little silt, brown, to light brown from 2-5, some pebbles 1/4-5" character, upper 2' loose with organic remains, lower 3' (3-5') firm, all dry except for upper 1' moist due to recent rain	Hnu of sample 0 ppm
5-10'		100% SS2		Clay, brown, little silt, little pebbles, dry, 5-6' Sand and Gravel, ~~to~~ medium-coarse, angular, sand, quartz and rock fragments feldspar including feldspar, mafic minerals, wet, ~~so~~ little clay, some pebbles 1/2-1", rounded, 6'-10'	Hnu of sample at three locations 0 ppm
10-15'		SS3 100%		Sand and Gravel, same as above, ~~to~~ from 10-12.5, loose Clay, brown, some silt, pliable, firm, from 12.5-14.5' Sand, fine to coarse, some clay, angular little pebbles 1/4-1/2", 14.5-15'	Hnu of sample 0 ppm HB 0 ppm
15-20'		SS4 60%		Clay, brown, little silt, very pliable, very moist, TD 20'	Hnu of sample <1ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG88 MW16	DRILLING STARTED: 8-10-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-10-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		70% SS1	X	Peat, black (clay and organics), little silt, 0-2' moist ~~clay~~, 3-5 ~~2-5~~, wet, very loose,	Hnu of sample 0ppm
5-10		SS2 100%		Peat, same as above to 6.5' Clay, ~~little~~ brown, little silt, pliable, wet, trace ~~no~~ pebbles (6.5-10') no odor	Hnu of sample <1
10-15		SS3 100%		Clay, dark brown, little silt, some organics, same as above, pliable, wet Sand, brown, fine to medium, trace coarse, trace gravel, some ~~little~~ clay, 14-15', loose, wet	Hnu of sample range from 0-1 ppm
15-20		SS4 100%		Clay, dark brown, little silt, pliable, moist-wet, same as 10-14, trace pebbles 1/4-4" diameter	Hnu of sample range from 0-3ppm
20-25		SS5 100% elongated core recovery		Silt, brown, some clay, little sand, fine 20-21 3/4, rare pebbles, very moist Sand and Silt, brown 21 3/4-25', some clay, fine-grained sand, trace pebbles	HA @ <1ppm Hnu of sample 3ppm at one location <1ppm at another
25-30		SS6 80%		Gravel, 1/4" coarse, some sand, medium-coarse, total sand 1', ~~[illegible]~~ from 28.8-30 ~~[illegible]~~, Cored 2 1/2' of boulder gravel composed of rock fragments, angular, and quartz, feldspar, mafic minerals Boulder - appears to be same comp. as gabbro in bedrock	hit boulder at ~~28~~ 26.5', boulder is from ~~35-37 1/2~~ 26.7-28.9

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG88 MW16	DRILLING STARTED: 8-10-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-10-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
30-33.66'				Bedrock,	
				TD 33' 8"	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF ____

WELL/BORING ID: DANG B MW17 Site 8	DRILLING STARTED: 8-10-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-10-88
PROJECT NO: OR001	DRILLING METHOD: Rotosonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		~~80~~% SS 180%		Peat (clay), dark ~~brown~~ blk, organic material, plant fragments, dry 0-2', moist 3-5',	HBU sample reading 0 ppm
5-10				Silt, some clay (35%), brown, firm, very moist to wet no pebbles, pliable Sand, ~~some clay~~ fine-med, some clay (25%) no gravel or pebbles 9½'-10'	HA <1ppm HB <1ppm
10-15				Clay, brown, some silt, wet, some pebbles, increase in silt in lower 2' with little sand, fine TD @ 15'	

ENGINEERING-SCIENCE
DRILLING RECORD

SITE 8

WELL/BORING ID: DANG8 MW18	DRILLING STARTED: 8-5-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-5-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E. Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5'	SS1	80%	*	SILT and clay, brown, little sand, ~~some~~ numerous pebbles and rock fragments 1/4" to 4" diameter, dry,	Fill Hnu of sample <1 ppm HB 0 ppm HA <1 ppm windy day
5-15'	SS2	recovered 4' of 15' - 25%	*	Silt and Gravel, brown, in upper 1' of splitscore, probably from interval 8-11' wet, some sand, firm little clay,	Expect water table at ~8'
	SS3 14-15		*	clay, brown, lower 3' of sample, some silt, little pebbles, dry, very firm,	
15-19'				Bedrock, pieces are fractured into 3" pieces	
				TD 19'	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF ____

WELL/BORING ID: DANGB8 MW 19	DRILLING STARTED: 8-10-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-10-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD: continuous core
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		SS1 60%		Clay, dark brown, some silt, little sand, fine, slightly moist, no pebbles or gravel	Hnu of sample <1ppm
5-10		SS2 100%		Silt, brown, some clay, (some sand at 7-8') very moist to wet from 5-10', Firm, some pebbles 1"-3" diameter. Wet at 7-8' sandy zone	Hnu of sample at 3 areas <1ppm
		SS3 9-10'			HA <1ppm
10-13.5		100%		Bedrock, core,	

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE 1 OF 1

WELL/BORING ID: DANG8 MW20	DRILLING STARTED: 8-5-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-5-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SS1	0-2X	Clay, brown, some silt, rare or trace pebbles, dry, very firm	
5-6.5		SS2 100%	6-8X 2-8	Silt, brown, some fine sand, some ~~little~~ clay, little 1/4-1/2" pebbles, very damp - almost wet	0-6.5 gradual increase in amt of sand and silt
6.5-15'		SS3		Silt, some fine sand, brown, little clay, little pebbles, wet, firm to 8' then	Hnu of sample 0 ppm Estimate top of water table at 6.5'
~~15-20.5'~~				clay, brown, some silt, little pebbles, damp to 9' then	Hnu of sample <1ppm
				Silt, some sand and gravel, fine to course sand, some rock fragments up to 5" diameter to 15' very damp, very firm, some thin fine-medium sand lenses up to 5" thick in this section	
15-20.5'		SS4		Silt and clay, brown, some pebbles 1/8" - 3" randomly distributed, firm, damp, btm 2" bedrock	Hnu of sample 1ppm
20.5-23.5'				Bedrock, cored 3' into it gabbro, competent, dark gsh-green	
				TD 23.5'	

ENGINEERING-SCIENCE

DRILLING RECORD

WELL/BORING ID: DANG8 WP9D	DRILLING STARTED: 8-11-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-11-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-6'			30% SS1	Clay, light brown, little silt, organics, from 0-6", firm Peat, ~~6"~~ black, organic rich, from 6" to 18" dry to slightly moist	Hnu of sample 0 ppm
6-10'			100% SS2	Clay, brown and black, some peat, moist, ~~6-7'~~ ~~5-6'~~ 6-7' Clay and ~~Gravel~~ Sand gravel + , some pebbles, ~~little~~ ~~sand~~, fine to coarse, wet, pebbles may be 1-3" diameter, color of interval ~~6-10~~ 7-8.5 is dark gray Clay, brown, little gravel, little pebbles, ~~7.5-10'~~ 8.5-11', moist	Hnu of sample <1 ppm Hnu of casing HA 0 ppm HB 0 ppm
~~10-12'~~ 11-18			100% SS3	Clay, brown, pliable, wet, 11-12' Sand and Gravel, medium to coarse, some pebbles 1" to 3", angular, quartz and rock rock fragments, loose, wet 12-13½ Clay, same as 11-12' but from 13½-16, some pebbles, Silt, some clay, brown, pebbles ¼-2" diameter 16-18', ~~wet~~, moist, firm	Hnu of sample <1 ppm
18-26			100% SS4	Gravel and Sand. same as 12-13', from 18-18½, wet Clay, same as 13½-16, little silt, from 18½-21, very moist Clay and Silt, brown, some pebbles ¼-2", little sand, fine 21-26' pliable, very moist	Hnu of sample 0 ppm

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG WP 9D	DRILLING STARTED: 8-11-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-11-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST: Peter E. Riemersma	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
26-36		90% 555		brown Clay, some silt, little pebbles 1/4", pliable, wet to very moist, 26-28' Silt, ~~som~~ brown, some ~~silt~~ clay, some gravel, little rock fragments pebbles, slightly moist, firm 28-31 Silt, brown, some sand, fine, little clay, little gravel and pebbles, slightly, moist, firm	Hnu reading of samples 3 ppm - maybe moisture in bag
36-41		100% 556		Silt, brown same as above with some gravel, dry, very firm — difficult to break	Hnu readings of samples 0-2 ppm
41-46		100% 557		brown Sand, fine-medium, little clay, quartz and small rock ~~fragments in san~~ make up the sand, wet, loose, 41-41½' Silt, brown, same as 36-41 interval, dry, hard, some pebbles and some gravel	
46-~~51~~ 54				Boulder, ~~gabbro~~ granite, 46-~~48'~~, 47½' Sand and Gravel, coarse, some ~~silt layers~~ silt layers 2" thick with coarse sand, ~~48'-50½~~ 47½-~~48½~~ 49 wet, Clay, some silt, ~~50½-51~~ 49-~~49½~~ 50, firm, slightly moist ~~Sand and Gravel~~ Silt as above ~~47½-49~~ ~~from 50-51½~~ Bedrock, ~~51½~~ 50-54	

TD e 54

ENGINEERING-SCIENCE
DRILLING RECORD

PAGE ____ OF ____

WELL/BORING ID: DANG 8 ~~MW~~ WP 9 S	DRILLING STARTED: 8-11-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-11-88
PROJECT NO: OR001	DRILLING METHOD: Rotasonic
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		50%		Peat, ~~mom~~ dark brown to black, numerous plant root fragments, loose, dry	
5-15		100%		Sand and Gravel, dark grey, fine-coarse little clay, wet, loose 5-6' Clay, some silt, ~~little~~ trace pebbles, very moist, becoming siltier down, 6-12½ Sand, some clay, some gravel, rock fragments fine-coarse, wet, 12½-14½ clay, some silt, some pebbles ¼-2" 14-15', very moist	
15-21				silt, little clay, some pebbles & little gravel, slightly moist 15-18 Clay, same as 14-15', 18-21' TD @ 21'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG8 MW/WP 10 (shallow)	DRILLING STARTED: 8-6-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-6-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		100% SS1		Clay, some silt (35%), brown, scattered black organic rich areas, dry, firm, ~~rare~~ trace pebbles up to 2" diameter	Hnu of sample <1ppm; Upper 6' probably fill
5-10'		100% SS2		clay, brown, same as above to 6'; Peat, d brown to black, organic plant material, soft, loose, wet, little clay, trace silt, no pebbles (dep. env. swamp) (bog)	Hnu of sample 0 ppm
10-15		SS 3 80% compressed		Clay, dark brown, abundant plant fragments in top 1' of interval; clay, dark grey to black, no plant fragments, trace silt, or natural organic odor, faint laminations to 12'; Sand, ~~with gr~~ fine to coarse, some clay, some silt, to ~~12.5~~ 13', wet; Gravel (~~12.5~~ 13 to ~~14~~ 14'), some sand, fine to coarse, trace clay, wet, loose; ~~silt~~ clay, (14-15'), some silt, brown, moist, firm	Hnu of sample 0 ppm.
15-20		SS4 80%	probably missing 1½ of gravel/coarse sand, wet	silt, brown, some clay, little pebbles ¼-½", moist, firm to ~~18~~ 17½'; Silt, brown, some clay, trace pebbles 17½ ~~ft~~ to ~~17~~ 19'; dry; clay ~~[illegible]~~ 19' to ~~18~~ ~~[illegible]~~ 20', little silt, trace pebbles, slightly moist	Hnu of sample 0 ppm; HA 0 ppm; HB 0 ppm
				TD @ 20'	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 8 WP10 D	DRILLING STARTED: 8-6-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED: 8-6-88
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
0-5		SS1 90%		Clay, brown, pebbles 1/4 to 1" diameter common (20% of core) some silt dry, probably fill material	Hnu core sample is 0 ppm
5-10		SS2 90%		Clay, same as above, but last 6" (9½-10) ~~get~~ is PEAT, woody and plant layer. May represent end of fill and old soil layer, Core becomes moist at 8' (change from dry)	Hnu of sample is 0ppm HA 0 ppm HB 0 ppm
10-15'		SS3		~~Clay~~, Silt, brown to dark brown, some clay, rare small pebbles, very organic rich with small plant fragments, loose Wet from 10-14' Last 14-15' is Clay, some silt, pebbles common 1/8-1/2" damp to slightly moist	
15-20		SS4		Clay, some silt, brown, pebbles common, 1/4" to 3" diameter, very firm, slightly moist clay appears to be rock flour	HA casing - filled with water no reading HB - 0 ppm Hnu of sample 2ppm
20-22.5		SS5		Sand, brown, fine, some clay, in top 4" (20-20.3') wet, loose Silt and Clay, brown, pebbles common 1/4-2", very firm, slightly moist	

ENGINEERING-SCIENCE
DRILLING RECORD

WELL/BORING ID: DANG 8 WP 10 D	DRILLING STARTED: 8-6-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
22.5-32		100% 556		Silt, brown to dark brown, some sand, fine to medium, little gravel, little clay, very wet 22.5-23.3' Silt and clay, brown, little sand some pebbles, 1/4-5" diameter slightly moist, very firm, interval 23.3-27.5'	Hnu of sample at three locations 0 ppm 2 ppm 3 ppm ~~Core~~ moisture is on inside of core bag
27.5-32		100% ~~554~~ 556		Clay, some silt, brown, small 1/8" rock fragments and pebbles common, very firm, slightly moist Pebbles can get up to 5" diameter	Hnu of Sample 0 ppm
32-35		100% 557		Same as above, small angular rock fragments (<1/2" diameter) and pebbles, ~~are very angular and~~ pebbles can be up to 5" diameter slightly moist to ~~very~~ dry	Hnu of Sample 2 ppm 3 ppm
35-40.5				Silt ~~and~~, some clay, ~~little~~ ~~some~~ some (15%) sand, fine to course, ~~peb~~ little gravel, angular, ~~to~~ pebbles rounded to angular, 1/4-2" diameter, from 35-37 moist ~~to~~ wet, 37-40.5 silt interval slightly moist with trace gravel, little sand some clay	HA 0 ppm HB 0 ppm
40.5-45				Silt, brown, little clay, some fine-med sand and gravel, Large cobbles 4" diameter at 40.5-41' and scattered in rest of core. wet to moist, ~~are~~ small, angular rock fragments common	Hnu of sample <1 ppm

ENGINEERING-SCIENCE

DRILLING RECORD

WELL/BORING ID: DANG 8 WP 10D	DRILLING STARTED: 8-5-88
LOCATION: Duluth ANGB/Duluth, Mn.	DRILLING COMPLETED:
PROJECT NO: OR001	DRILLING METHOD:
DRILLER: North Star Drilling Co.	SAMPLING METHOD:
LOGGER:	STATIC WATER LEVEL:
GEOLOGIST:	WATER LEVEL DATE:
SIGNATURE:	WATER LEVEL DATUM:

DEPTH IN FEET BELOW LS.	SAMPLER BLOWS	PERCENT RECOVERY	LITHOLOGY	SAMPLE DESCRIPTION	WELL CONSTRUCTION
45-47.5		100%		Bedrock, gabbro upper 5", is fractured, rest is in 1½' pieces	
				TD 47.5	

Q.2.9 Notebook 8, Field Team Leader Notebook No. 2

This notebook contains notes of the Field Team Leader for work done during February, 1989. The notes are on the second ground water sampling round at Site 10 and also contain the water level measurements taken at that time. Seventeen pages were used. The first entry is 25 February 1989 and the last is 28 February 1989. The pages are signed by Jo Ann Sherwin

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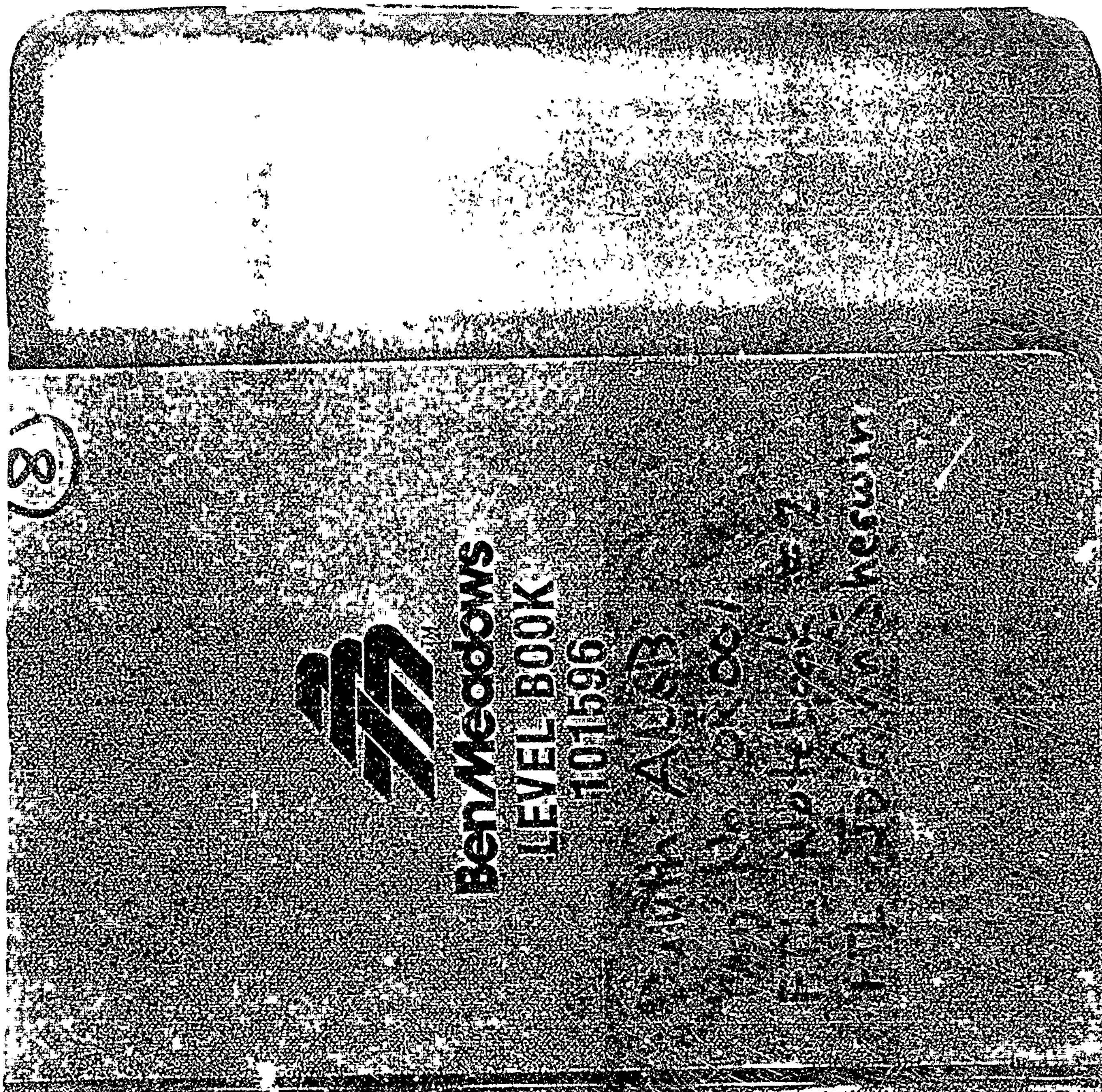
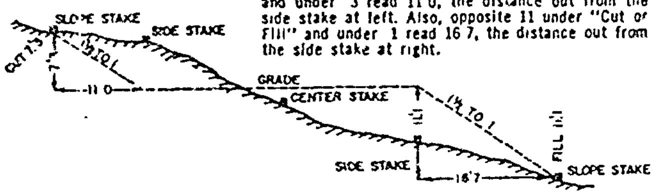

BenMeadows
LEVEL BOOK
101596

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below opposite 7 under "Cut or Fill" and under 3 read 11 0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under 1 read 16 7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0 6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2 0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3 0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5 4	5 6	5.7	5.9	3
4	6 0	6.2	6.3	6.5	6.6	6 8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8 6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10 1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14 9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21 9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23 4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45 2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

Peninsular Publishing Company
P.O. Box 5078 Tallahassee, FL 32314
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4.

~~2~~2/25/89

2:00p arrived Duluth
Picked up bailers, survey meter, insulated gloves and other material that was shipped. Checked to see everything was there. Charging HNU meter. Will go to hanger to organize the rest of the material and then to the store to buy a few odds and ends such as aluminum foil.
Personnel: Jo Ann Sherwin and Ted Volskay.
Overcast, temperature in upper twenties, lower 30's
5:45 returned to hanger and

Jo Ann Sherwin 2/25/89

5.

deconned the bailers and water level measurement tools. Prepared for tomorrow morning.

Jo Ann Sherwin 2/25/89

2/26/89

7:30a Jo-Ann Sherwin & Ted Volskay, gray, overcast. leave motel, stop for coffee and go directly to site 10 for ground water sampling. Calibrated pH meter and conductivity meter.

~~8:50 at~~ JS 7:50

Cold & very windy. about a foot to a foot and a half of snow on the ground, drifts are higher and plowed piles are over 5 feet.

8:50a at site 10. To do Well GW 10-C first.

Jo-Ann Sherwin 2/26/89

TOC to water 3.23'

T.D 15.28'

bail 1.28 g - purge

pH 8.09

Temp - 0.6°C

finished this well at 11:15 a

Onto Well GW 10-B. There is a very stiff wind and the temperature is about 10°F.

GW 10-B

TOC to water	T.D	purge
7'11"	15'2¼"	1.25g

pH 9.39 fluctuating Conduc. .19

temp -.9

Jo-Ann Sherwin 2/26/89

9: JS 2/26/89

11:30 break for lunch and warm up. Very windy, very cold.

12:30 deicorned bailers and water level measurement tools

1:45 left hanger for GW 10-A. will take a duplicate sample there and call it GW 10-D

The sun is out so it looks warmer, but it is still very windy & very cold.

Conduc	TOC to water	TD	Purge	pH	Temp
7.634	9'4"	23'	2.5 gal	7.16	7.4 Conduc 6.2 pH water
7.66				7.3	3.1 Conduc 2.5 pH

Readings are for duplicate

There are for 10-C, samples sat out in air for 1/2 hr before reading temp. J. Sherwin 2/26.

Water level measurements JS 2/26/89 10

Location	time	depth from top of casing
~~MW 2~~ JS 9/26		
2-MW 41		7'8.4"
~~GW 2-A~~ JS		
~~MW 7~~ GW 2A	3:35	9'10.5"
2MW 40	3:45	8'0.2"
MW 7	3:50	9'0.75"

MW 6 only went as far as 3'3.36" and can't go any farther. Stick up is 2½' above snow. Snow only about 1' deep here. Probably frozen at ground level.

2MW 39	4:05	7'6.2"
MW 5	4:15	6'9.8"
2MW 38	4:25	9'3.5"
GW 2-B	4:30	5'8.5"
2 MW 37	4:40	6'5.25

Looked for MW 4 and could not find it. It must be

JoAnn Sherwin 2/26/89

under the pile of snow that the snow blower has blown when clearing the road. There was a flag that we dug around maybe 1½ foot down, but we could not find evidence of this well.
Finished about 5:00 and went back to the hangar to prepare the samples for shipment. Will ship tomorrow.
left hangar 6:00 p

Jo Ann Sherwin 2/26/89

Sunny 2/27/89 not windy

Arrived at hangar at 7:30 a. Sun just up -5°F. Will do ~~mw~~ wells around this side of the airport, and then go back over ~~to~~ Site 2. J. Sherwin, T. Volskay

Location	Time	Depth
3-MW 26	8:00 a	8'8.6"
3-MW 25	8:05 a	8'4.8"
3-MW 27	8:12 a	5'1.7'
3-MW 29	8:20 a	7'5.0"

Can't get to ~~BG~~ 3 wells on pad — snow too deep. Go buy snowshoes

GW 3-A	12:00 p	11'11.75"
3MW 31	12:10 p	~~8~~ 9'8.9"
3MW 30	12:20 p	8'9.4"
BGMW 32	12:30 p	10'0.2"
3MW 34	12:40 p	8'3.5"
3MW 33	12:43 p	8'2.2"

Jo Ann Sherwin

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location	time	depth
GW 3-C	12:55p	7'7.2"
GW 3-B	1:02p	9'6.85"
3-MW 2S	frozen solid @ 2'5"	
3-MW 3S	1:33p	7'~~0.7~~ 8.0"
GW 3-D	1:37p	6'7.5"
Go to site 2		
GW 2-C	2:50p	10'6.6"
WP 7D	frozen solid at 2'4"	
WP 7	frozen solid at 3'7"	
~~MW~~ 7 MW-4 5/15/89	3:19p	9'1.5"
WP 6	3:33p	8'3.25"
MW 2	3:46p	10'11.35"
MW 1	3:54p	14'0.3"
GW 2E	4:02	TOC 12'9.75"
		– 10.75"
		[illegible]
		11'11"

cloudy, getting cold

Jo Ann Sherwin 2/27/89

14

location	time	depth
GW 2-D	4:16	13'2.6"
WP 8	4:38	7'9.2"

Shipped samples by FedEx, deconned bailers, took inventory, left hangar at 6:15p

This was MW 4. Mistake realized when compiling data for draft report. After we bought a shovel we went back & found this hole. A tall plow marker marked its vicinity. Jo Ann Sherwin 5/15/89

Jo-Ann Sherwin 2/27/89

2/28/89

Ted Volshay, Jo-Ann Sherwin
10° cloudy, snowing lightly.
Over an inch since
yesterday. It's supposed
to stop later this morning
and get colder

location	time	depth
3-MW 14	8:26a	10'3.0"
3-MW 15	8:30a	10'6.8"
3-MW 16	8:45a	8'5.25"
3-MW 17	8:47a	8'3.0"
GW 3-C	9:07a	10'2 3/4"
4 WP 16D	9:16a	5'10.7"
GW 4-B	9:35a	6'2.4"
4WP 11	9:40a	10'5.6"
3WP 9D	9:46a	10'1.4"
6WP 7	9:50	9'4.7"

Jo-Ann Sherwin 2/28/89

2/28/89

location	time	depth
BG 43	10:46	12'7.3"
GW 8-A	11:06	7'9.25
GW 3-B	11:10	3'5.0"
4WP 12	11:28	3'3.7"
4WP 12D	11:30	8'10.6"
8 WP 10D	11:52	9'11"
8 WP 10	11:53	10'0.25"
MW 10 no lock	12:00	7'6.2"
4MW20	12:02	6'6.75"
MW 3	12:06	8'5.7"
Lunch break		
BG-MW42	2:25 frozen at	3'5.5"
4 MW21	2:48	8'10.5"
MW 9	2:50	8'9.5"
4MW 22	3:05	10'1.6"
GW 4-D	3:10	11'4.7"
GW 4-C	3:20	11'9.7"
4 WP 13D	3:37	12'4"

Jo-Ann Sherwin 2/28/89

2/28/89

location	time	depth
4WP13	3:45	10'4.25"
4-MW 23	3:52	9'6.8"
4-WP15	4:12	10'2.2"
4-WP15D	4:20	10'9.25"
GW 4-A	4:44	6'4.5"

Couldn't find:

4-WP14 }
4-WP14D } all under too
MW 11 } much snow to
be found.

Sent equipment off by
Fed Ex. Left airport at
5:30p. Done for this trip.

Jo-Ann Sherwin 2/28/89